Compliments of

Bundy Allen

THE JOURNAL OF ROENTGENOLOGY

VOLUME I
1918

PUBLISHED QUARTERLY BY
THE WESTERN ROENTGEN SOCIETY
IOWA CITY, IOWA, U. S. A.
1918

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Published by the Western Roentgen Society, Inc.

VOLUME I — First Quarter, 1918 — NUMBER 1

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THE JOURNAL OF ROENTGENOLOGY is the official publication of the Western Roentgen Society, Inc., and is published under the authority of the Society.

Address communications and manuscripts for publication to the Editor, Dr. Bundy Allen, Iowa City, Iowa.

Subscription rate—$5.00 per year, $1.50 per copy.

EDITORIAL

Scarcely two and one-half years have elapsed since the nucleus of this society was formed by a half dozen energetic gentlemen. The aim of this society was to attract to it a large number of men whose interest ran especially to Roentgen work. It was thought that such a society could materially help its members by keeping them abreast with the very rapid scientific advancement of Roentgen work in the various branches of medicine. Unlimited and untiring effort,—regardless of time and personal expense,—have been expended by a great number of the members of this society in building up in this short space of time a roll of one hundred and fifty-one members together with a large number of applications now on file for active membership. This membership represents seventeen states.

The organization of any medical or Roentgen society is accomplished with very little effort, but to keep that society up to the high standard that is absolutely necessary for its success, requires continuous and undivided effort. We feel that this continuous and undivided effort is amply proven by the results so far obtained, and we furthermore believe that if we can have this enthusiastic support from the individual members singularly and collectively there will be no question as to the success of the society in the future when we are called upon to make the many changes that are in contemplation.

Journalizing the Western Roentgen Society was attempt-

ed during a time that was most unfavorable. When this publication was begun we were confronted by several unpleasant and imposing facts;—viz., a depleted membership, an increased cost of raw material, and the assurance that the ensuing year would demand of the personnel unlimited giving and also repeated giving; which giving, each and every member has and will be pleased to continue to the finish. Notwithstanding these apparent insurmountable difficulties we felt that the society was in a condition, scientifically and financially, that justified and even necessitated putting forth a publication that we hope may fill a much needed want.

B. A.

THIS PAGE WILL BE GIVEN IN EACH ISSUE OF THE JOURNAL FOR ANY SPECIAL ANNOUNCEMENT THAT THE PRESIDENT OF THE ORGANIZATION MIGHT HAVE FOR THE MEMBERS OR THE READERS.

To the Readers of the JOURNAL:

The science of Roentgenology began as have most all of the important branches of science in a credulous or mysterious manner. Very soon, however, investigators realized that a new avenue to facts had been opened. Wonderful scientific demonstrations were recorded and published which were studied throughout the world. The decisions following these perusals were of two classes; first, that the whole thing was wrong and enshrouded by illusions, and second, that possibly new and momentous truths could thereby be determined. The latter class came mainly from other branches of science. These scientists began immediately to utilize the new established facts in the investigation of problems in their own respective fields. The results of these achievements coupled with the new knowledge incident to the work of a great corps of the keenest intellectual investigators, who devoted their entire attention to this science, brought the subject to occupy a field, the scope of which cannot be individually estimated, with unprecedented rapidity.

In the application of this science to medical problems it very early became evident that physicians should organize in their efforts to utilize it most effectually.

Many years ago a feeling arose in the minds of Roentgenologists of the western part of the United States that an organization, constructed on democratic principles and ded-

icated to the study and practical application of the science, should be established. This feeling expanded almost unconsciously into a demand for an organization, and finally culminated in the year 1915 when Roentgenologists from seventeen different States of the middle West and South assembled in Chicago and pledged themselves as charter members of an organization to be known as The Western Roentgen Society. Since that time this organization has held annual and mid-annual meetings, the scientific programs of which have been exceptionally creditable and instructive. A most valuable, friendly and coördinate feeling has been developed, among the members as well as the Roentgenologists of the West, at these meetings.

At the annual meeting during January, 1918, in Chicago it was decided that the Society should provide a means for further recording and distributing its work. A publication committee was appointed, an editorial staff selected and the publication of a Journal was ordered.

The Society was exceptionally fortunate in being able to select from its membership a physician whose qualifications are known to be in every way commendable for the position of Editor, and under his editorship The Journal of Roentgenology will prove a great asset to the organization and a valuable contribution to the science.

The present conditions of war have made the organization and its work more important and useful to its members. It will be the aim of the organization to provide information whenever possible to its members concerning such subjects as vitally concern those who contemplate applying for commissions in the service of our Government, as well as those who are serving in the home lines.

In closing this conspectus, the writer trusts that the reader may recognize the circumstances which underlaid the inception of the organization as well as the journal.

President B. H. O.

A DISCUSSION OF WHAT HAPPENS IN A ROENTGEN TUBE

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1925 Marshall Field Annex Bldg.
Chicago, Ill.

In order to form a conception of what happens within a Roentgen tube, one must understand something of the nature of matter and especially those elements of matter entering into the construction of a Roentgen tube, as well as electricity.

In this paper, I propose to discuss briefly and as far as possible separately:—

1st. The Anode or Anti-Cathode
2nd. The Cathode
3rd. The Electrical Discharge
4th. The Cathode Ray
5th. The Roentgen Ray

My discussion of the Roentgen Ray will be very brief in this paper and will be concerned only with what seems to be the most useful theory of its production at the Anode.

The kind of tube upon which I wish to base my remarks principally is the hot cathode or Coolidge tube. In this connection, I wish to say that in my judgment, we as Roentgenologists owe our greatest debt of gratitude to Dr. W. D. Coolidge, excepting only W. C. Roentgen, the discoverer of the Rays themselves.

The Coolidge tube as it stands to-day marks the greatest step in advance in the science of Ronology since Roentgen discovered the rays.

Aided by such co-workers as Hull, Davey, Moore and others, Dr. Coolidge through the experimental laboratories of the General Electric Company continues to be our most

potent and productive source of scientific achievement for Roentgenology.

The Coolidge tube is superior in almost every respect to any other form of Roentgen tube.

The Anode (Anti-Cathode, Target)

Several points are to be considered in discussing the Anode. Because of its high atomic weight Tungsten has been almost universally adopted for this purpose. It has an atomic weight of 184.0.

The atom of tungsten at ordinary temperature shows very little tendency to liberate negative electrons. It is this property which makes the hot cathode type of tube capable of carrying an electrical discharge in one direction only.

Tungsten is also suitable anode material because of its high melting point, which is about 3400 degrees C. in the atmosphere.

Tungsten also possesses high thermal conductivity. Comparing with platinum as 0.35 to 0.17. This property accounts for the rapid distribution of the heat generated at the focal spot throughout the mass of material in the anode and thereby permits a small focal point so essential in clinical roentgenology, described so nicely by Kreugler.

Tungsten also possesses a high radiation value and compared with platinum is as 91 to 100.

Tungsten has a low vapor pressure at very high temperature. It shows evidence of volatilization at about 1800 degrees C. Melts at 3400 degrees C. and boils at 3700 degrees C.

Cathode

A study of the cathode is closely interwoven with the study of the electron and the electrical theory of the constitution of matter. This theory is the most serviceable basis for our best explanation of the origin of Roentgen Rays

and the physical reasons for the properties of radioactive substance, such as uranium and radium.

Until the Coolidge tube was introduced, we were concerned with various physical phenomena within the Roentgen tube. This has now been entirely eliminated. The hot cathode type of tube as introduced by Dr. Coolidge in 1912 depends entirely for its operation upon the thermionic emission from the cathode.

In the old type of tubes various metals were used in the cathode. The most suitable kind of cathode material was generally conceived to be aluminum. It was found to be especially adapted for this use because of its atomic construction. Its atoms possess vast zones of loosely combined electrons as compared with platinum and tungsten. This fact aided greatly in maintaining its position in the electrical discharge as the cathode pole.

Aluminum delivers electrons more freely as the temperature arises. The heat generated at the cathode during an electrical discharge in a vacuum tube is roughly proportional to the amperage of the current used in the discharge. It is evident then that aluminum automatically adjusts itself in liberating electrons to meet the demand made upon it at the cathode pole. It will be readily observed that if the amperage is sufficient, the heat generated at the cathode will be high enough to melt the aluminum, and the molten portions would be found to fly away from the cathode and become flattened out against the glass on the opposite side of the bulb.

If the cathode and anode were constructed of the same materials or metals they would also present the same capacity for liberating electrons and would be equally balanced in their tendency to allow the current to pass in both directions.

Aluminum was also found suitable because its volatilizing power was high, in fact almost as high as the melting point.

It also has the property of liberating hydrogen when heated to a degree sufficiently high to force it to give up its gases.

Hydrogen has been found to cause very little if any damaging phenomena in the tube unless liberated from the metals in considerable quantities.

Inasmuch as it is my purpose to discuss almost entirely those phenomena in a Roentgen tube of the hot cathode type, I will reserve further discussion of the cathode as presented in a Coolidge tube until later in this paper.

Electrical Discharge

Any complete description of an electrical discharge in a vacuum tube must involve a consideration of the production of the current and of what it consists.

In this connection, I would like to present a few brief statements. Most of us remember the study of two kinds of electricity—*positive* and *negative*. Bodies with similar electrical charge repel one another. Bodies with unlike, that is, positive and negative charges, attract one another. (Figure one, page 20.)

In the analysis of matter, we may recall that bodies are composed of molecules. These molecules are of almost every conceivable shape. They depend for their properties upon their number, nature and geometrical arrangement of their atoms. Such enormous numbers of variations are hereby possible as to permit the formation of a vast number of different substances. For example, there are now known several hundred thousand substances in which the molecules are composed for a part at least of carbon, and that the other elements in these molecules are but three in number—Hydrogen, Oxygen and Nitrogen. Undoubtedly many other molecules than those now known with carbon are in existence and await further work for their discovery.

At the present time our knowledge covers about 100 distinctly different atoms. If one substance is found to attract another substance, it indicates that the atoms composing their molecules have unlike electrical charges.

The atoms depend for their electrical charge upon their electrons. The atom consists of a nucleus and electrons.

The nucleus possesses always and under all circumstances a definite positive charge of electricity. Very little more is known concerning the nucleus of the atom.

Surrounding the nucleus are vast numbers of negatively charged particles called *electrons.* These electrons may be thought of as surrounding the nucleus in different zones or fields. Certain zones are held very firmly by the nucleus. To remove electrons from these zones would greatly alter or cause destruction of the atom itself. Other zones of electrons are held by the nucleus more feebly and it is in these zones that electrons may be detached and removed or added to the atom without greatly altering the general nature of that particular atom.

The size of the electron is very small as compared with the size of the atom. As an illustration, it has been stated that if an atom were thought of with a diameter of 100 yards, its electrons would be approximately the size of a pin head. (Figure two, page 21.)

If the nucleus with its positive charge of electricity has sufficient electrons, the atom becomes electrically neutral. If this number be decreased, it then possesses a positive charge. If the electrons were increased, it becomes negatively charged. (Figure three, page 22.)

Electricity exists in the form of the power of electrons seeking an unsatisfied nucleus. An electrical current means a movement of electrons towards a positively charged center. As stated before, only certain electrons or perhaps zones of electrons in the atom are capable of leaving the nucleus without alteration or destruction of the atom.

The attraction which is manifested by some classes of atoms for an electron is much greater than others. Metals as a class show very feebly atomic attraction for electrons. As a class of substances it will be readily observed that metals are excellent media through which electrons may be

transported or in other words metals are good conductors of electrons or electricity.

If a current is passed through a metal, say a copper wire, it indicates that electrons were introduced at one end of that wire and delivered at the other end of the wire.

The speed which electrons assume in the conduction of a current through metal must not be confused with what has been termed the *speed of electricity.* The actual movement of the electron in metallic conduction is in fact infinitesimal to the speed of electricity. In this case electrons move at the most but a few centimeters per minute. The speed of electricity is very close that of light (186,300 M. per second). It consists of an impulse to move passed from one electron to another. This might be illustrated by placing two billiard balls upon a table a definite distance apart and permit the ball struck to cross the distance to the second ball and deliver its message to move. If the distance between these two balls were composed of a direct line of balls, the impulse to the last ball to move would occur in a very short space of time after the first ball received the impact. In the case of an ocean cable, an electron might be years traveling from New York to London while under proper conditions an electron at the New York end set in motion is noted in the electrons at the London end of the cable but a small fraction of a second later.

While the illustration answers very nicely for the passing of a current through a metallic conductor, the space between the two poles in a vacuum tube is very different.

As an electrical current is discharged into a vacuum tube, there must be an actual movement of electrons since the distance between the two poles is not bridged by atoms through whose electrons the electrical impulse may be passed.

It is evident then that an electrical discharge into a tube with rarefied atmosphere or any form of Roentgen tube

causes for the main part a liberation of particles with similar electrical negative charges.

In the hot cathode or Coolidge type of tube there are few if any positive Ions liberated from the anode. There is no appreciable generation of heat at the cathode except that due to the filament current. The vacuum is so nearly complete and the metals so nearly gas free that under all temperature this tube may attain in ordinary work, there are no phenomena of interest other than that arising with the thermionic discharge currents.

The walls of the Coolidge tube possess a negative charge differing in this respect from other types of tubes.

The speed which the electrons assume in passing from the cathode to the anode determines the wave length of the Roentgen Ray thereby generated. The more rapidly the electron is moving when making a contact with the atoms of the anode, the shorter the wave length thereby generated. The speed which the electrons assume in the Coolidge tube depends as in all other tubes upon the potential difference of the two poles at the time of the discharge.

Each electron as it passes on its course from the cathode to the anode represents a particle with a definite negative charge of electricity and possesses its radiating line of electrical force.

In the Coolidge tube the discharge is purely electronic and of thermic origin. The number or rapidity of their discharge depends entirely upon the degree of heat at the cathode. They are liberated from the heated spiral of tungsten in the cathode. They are concentrated upon the anode in a focal spot.

The number of electrons leaving the cathode determines the amount of milliamperage of current passing through the tube. Again it may be noted that in the Coolidge tube electrons are not interrupted on their way from the cathode to the anode by the presence of Ions or atoms from gases within the tube.

Cathode Rays

The Cathode Rays represent the electrons delivered into a vacuum tube from the negative pole of a suitable electrical current. These electrons leave the cathode in abeyance of the forces of attraction to the anode.

The weight or mass of these electrons is said to be about 1-1800 part of the smallest known atom—that of Hydrogen.

Their speed varies greatly, but generally it may be said to be about one-tenth that of light.

Their shape is said to be spherical when traveling at low speed, but that they become oval or flattened when traveling at a speed approaching that of light.

It has been shown that they leave the cathode at right angles to the surface of the cathode pole. They travel in straight lines until they are interrupted in their course.

They are capable of passing through solid substance, even through atoms themselves.

Cathode Rays can be bent out of their course by the action of a magnet. They also respond to the action of an electrical field in much the same manner as that of a magnet, except that they are deflected at right angles to the direction they assume when passing under the influence of a magnet.

While Cathode Rays are by far the most conspicuous and the most important rays present in a tube, there are other rays which deserve mentioning.

In tubes containing rarefied gases, there has been described positive rays or canal rays. These rays travel in the reverse direction to the Cathode Rays. They represent Ions which in the course of events have become detached from the anode and pass through the cathode stream or rays to the cathode.

An Ion is an atom from which certain of its electrons have been removed leaving it with a positive electrical charge. It has been shown that a small portion of the positive rays are deflected in their course in much the same

manner as Cathode Rays by the action of a magnet or an electrical field. The lines of their deflection however are in opposite directions to the lines of deflection noted with the electrons under the same influence. This fact corroborates the supposition that they have a positive charge. It has also been shown that they are much greater in masses or inertia. They probably reach the size of a hydrogen atom.

Cathode and positive Rays can be demonstrated very nicely by placing a bead of Lithium Chloride in the tube when it will show a blue fluroescence by the Cathode Rays and a red fluroescence on the side facing the anode from the positive rays.

Positive Rays have ionizing, fluorescing and photographic action.

It is evident from what has been said that in old or aluminum cathode type tubes, there are no cathode rays streaming over to the anode until the atoms in the anode have been deprived of certain electrons to the positive side of the dynamo, which generates the current. Then, from the negative side of the dynamo the cathode will become overfilled with negatively charged particles. At this instant positive Ions are liberated from the anode seeking negative particles. They will, of course, bombard the cathode. It is this bombardment which accounts for the heat generated at the aluminum cathode. The heat generated at the cathode is about one-fourth that generated at the anode in this type of tube.

The whole process of liberating electrons from the cathode is dependent upon the positive Ion bombardment and the subsequent heat generation. It is these positive Ions which do not reach the cathode but are attracted to the glass surface of the tube and deliver a positive electrical charge to the wall of the tube when in action.

Roentgen Rays

As the electron leaves the cathode en route to the anode, it represents a moving body possessing a definite electrical charge. Any body possessing an electrical charge is surrounded by a zone of electrical force radiating from the body in all directions.

If the charged particle or body is moved from one position to another, it carries its lines of electrical force with it. As it moves it must take a direction parallel with certain lines while at a greater or lesser angle to all other lines, inasmuch as the lines extend in all directions from the body.

After a charged body is set in motion and continues to move at a constant speed in a straight line, it becomes surrounded by the same zone or field of force lines with the same properties as when the body is at rest, and not influenced by or exerting influence upon any other body.

If this charged body is interrupted suddenly in its course, the lines which radiate from it continue to move in the same direction until the effect of the interruption of the central charged impulse reaches them. This impulse or news of the interruption moves along these lines of electrical force with the velocity of light. This impulse or news of the interruption to the central charged particle has been described as kinks in the electrical force lines. These waves represent electrical waves or light waves.

It is the speed with which the kinks or waves in the electrical force lines follow one another that gives quality to light. The slow wave representing Hertzian or heat waves. The shorter waves may represent visible light, ultra violet light, Roentgen rays or finally the rays of radioactive substances.

All light whether it be the sun or the heat or Hertzian waves travels at the same speed, but it possesses different wave lengths. Hertz waves of wireless telegraphy are over a mile in length, while the violet ray (the shortest visible

ray), has wave lengths of about one ten-thousandth of one inch in length.

Roentgen Rays depend for their wave length upon the speed at which the electron is traveling when it makes contact with the anode. It is the atoms of the anode which furnish the interruption to the electron, causing the kinks in their lines of electrical force and thereby generating Roentgen light.

Where the potential difference at the two terminals within a tube is great, or as we may say the voltage is high, the electrons assume a very high speed in traveling to the anode. The interruption produces therefore a shorter wave in its force lines. On the other hand, low potential variation means low voltage and longer waves. Rays with short wave length possess great penetrating power, and as the wave becomes longer the penetrating power is decreased.

The wave loses its effectiveness as it passes on its course from the anode. This loss is estimated as varying inversely as to the square of the distance.

Not all rays emanating from the anode are of similar wave lengths. Certain waves are generated as the electron reaches the first atoms of the anode. The electron probably passes through the first zones of electrons of the atoms of the anode, even through the atom to the deeper layers of atoms. Each point where its speed and course are interfered with represents a ray of different wave lengths. Each wave after the first interruption will be of longer wave length and consequently less penetrating.

If electrons could reach the anode at a speed equal to the Beta particles of radium, it would seem that we would be able to generate Roentgen Rays whose wave lengths would be as short as the Gamma Ray of radium. (Figure four, page 23.)

Discussion—Dr. Heber Robarts, Belleville, Illinois: Mr. President, Ladies and Gentlemen: I have always been of

the opinion that science, of which physics is a branch, should be obscure only to those in pursuit of phenomena. Once a thing discovered and understood the laws should be made plain to every one.

Contrary to the notion that a current of electricity runs through a wire from the generating apparatus is that the current is always there. Of course, the current is the electron and the electron is at the cathode. The molecular composition of the conducting medium is accelerated and in ratio of their acceleration, together with the heating at the cathode, does the electron speed away. When the apparatus rests the electron is static and becomes kinetic the moment the current is generated.

In an X-ray machine the generating apparatus is at one end and the Crookes tube at the other. The electron at the generating source does not leap through the wire to the cathode and thence to the anode—it simply pushes off the electron at the cathode. If the velocity of the electron is greater than 5,000 miles a second at the time it strikes the anode an etherial wave or electro-magnetic wave is evolved which represents the Roentgen ray. The striking effect of the electron, which is measured by the square of its velocity, determines the speed and number of X-rays. The speed of electron in a good working hard X-ray tube is 10,000 miles a second.

At the moment of transformation of an atom of radium there is discharged an alpha particle and an emanation; and the emanation in its several periods of transformation expels alpha particles, discharges beta particles and radiates gamma rays. The beta particle is the electron and has a speed of 150,000 miles a second; the gamma ray has the speed of light with the phenomenon of constancy. It has a short wave length which gives it a penetrating power one hundred times greater than any other known ray.

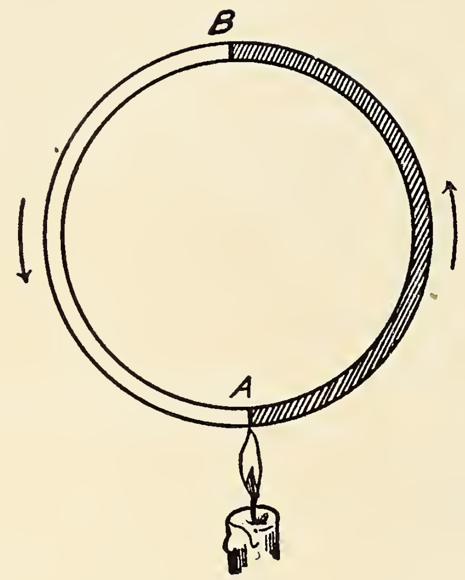
There is discharged from a good working hard Crookes tube 1,000,000 X-rays every second of time. From a gram

of radium there is radiated 3,000,000,000 gamma rays every second of time and with mathematical constancy.

Now the striking effect of a particle of matter is not proportional to its velocity, but the square of its velocity. Then the electron which causes the X-rays in a Crookes tube moving at a rate of 10,000 miles a second, and the beta particle which causes the gamma rays moving at the rate of 150,000 miles a second, then the beta particle strikes with an energy 225 times greater than the electron.

Dr. B. H. Orndoff, Chicago (Closing): There is nothing to say in closing other than to reiterate that the Roentgen Rays consist not in the discharge of particles from the anode, but that it represents waves or kinks in electrical force lines and that these waves or Roentgen Rays are light waves. The rays of light generated at the anode in a tube from the sun or from any other apparatus are waves in electrical force lines and that they travel at the same speed. The quality of light depends entirely upon the wave length. There is much to be said about the different kinds of light designated as Roentgen Rays, but the scope of this paper will not permit me to speak further of that at this time.

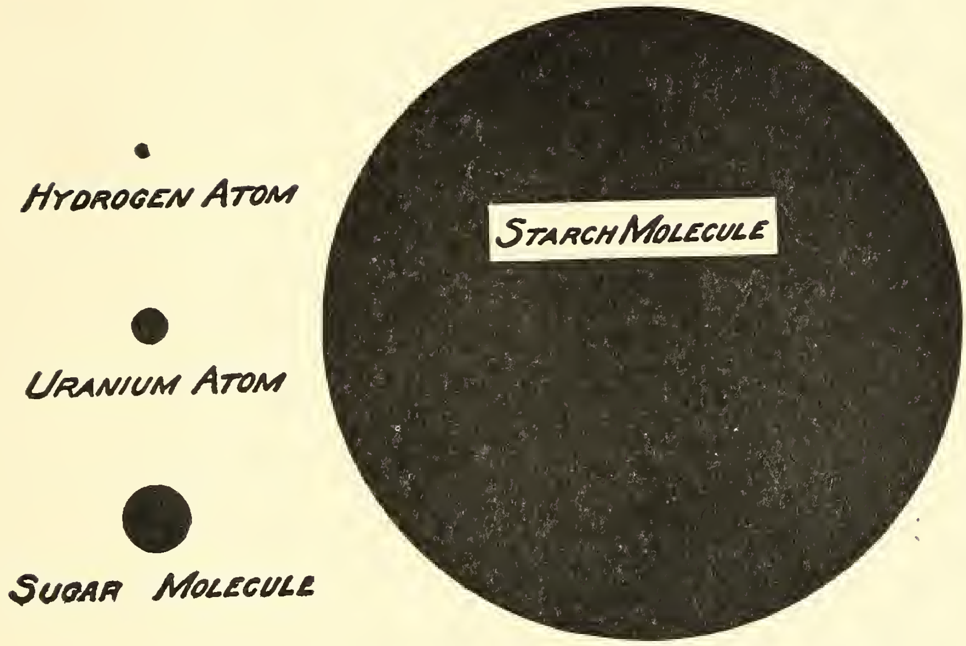
I wish in closing to express my gratitude to Dr. Robarts for the discussion he gave my paper.



A THERMO-ELECTRIC CIRCUIT

This is a symbolic drawing. The circle as a whole represents the complete electrical circuit, the left half being composed of a metal which emits electrons freely and the right half of one which parts with its electrons less easily. If the junctions *A* and *B* are both at the same temperature no current will flow, since the tendency towards a clockwise current which exists at *B* is exactly balanced by the opposite tendency existing at *A*. However, when the junction *A* is heated these tendencies are no longer exactly in equilibrium and electrons move around the circuit in the direction of the arrows. It is not necessary that the circuit should be made up of equal masses of only two different metals. It may be broken at any point and long wires of any sort of conducting substance introduced without altering its general principle.

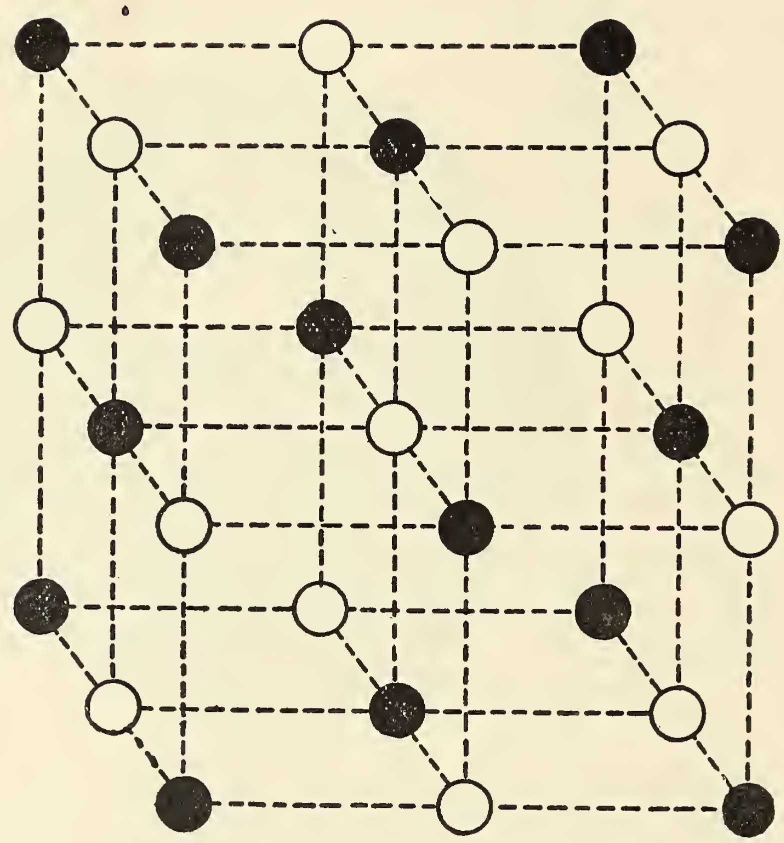
Illustration Copied from Comstock and Troland
Figure One



THE RELATIVE SIZES OF ATOMS AND MOLECULES

This diagram is intended to give an idea of the relative magnitudes of atoms and molecules. However, the drawings are only symbolic, as the dimensions have been calculated on the assumption that the molecules are spherical, which cannot be strictly true. It will be noticed that the smallest atom (that of hydrogen) differs only slightly in size from the largest atom (that of uranium). The starch molecule is probably one of the largest which exists and it will be seen that, according to the diagram, it is very much larger than the largest atom or than the molecule of sugar. The relative weights of the particles represented are as follows: Hydrogen, 1; Uranium, 239; Sugar, 366; and Starch, not accurately known but probably about 25,000. A molecule of ordinary alcohol weighing 46, would be slightly larger than the uranium atom.

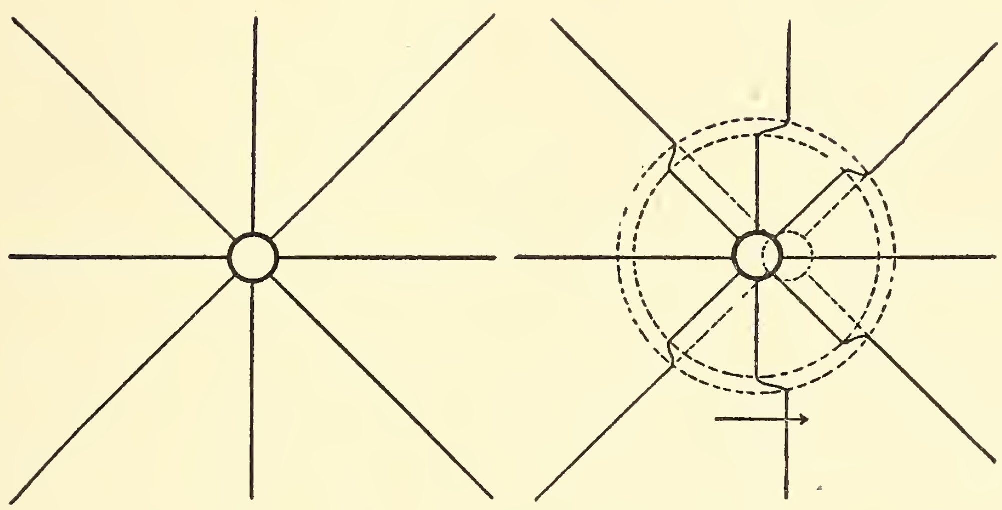
Illustration Copied from Comstock and Troland
Figure Two



STRUCTURAL PLAN OF A SIMPLE CRYSTAL

This drawing represents the structure of a crystal of potassium chloride, a substance similar to ordinary salt, as deduced from its action upon X rays. The dark spheres represent chlorine atoms, the light ones atoms of potassium. It will be seen that the unit of structure of the crystal is the individual atom, since all of the atoms are equidistant from their immediate neighbors. For the sake of clearness, the spaces between the atoms have been exaggerated, as compared with their diameters.

Illustration Copied from Comstock and Troland
Figure Three



TO SHOW HOW RADIATION IS PRODUCED BY STOPPING THE MOTION OF AN ELECTRICAL PARTICLE

The diagram at the left represents a charge of electricity with its radiating lines of forces. We will suppose this charge with its lines to be moving uniformly in the direction indicated by the arrow in the diagram at the right. When the charge is suddenly brought to rest the "lines" have a tendency to continue in motion, and do so until, so to speak, the news of the stopping of the charge has reached them. This "news" travels outwards from the charge with the velocity of light, along with the "kinks" in the force-lines which result from the discrepancy between the actual and the "expected" position of the charge. These kinks contain electro-magnetic energy and constitute light and other forms of electro-magnetic radiation. Such radiation is produced whenever any change whatsoever occurs in the state of uniform motion of an electrical charge.

Illustration Copied from Comstock and Troland
Figure Four

ROENTGENOLOGY AS AN AID IN DETERMINING THE PROGNOSIS OF PULMONARY TUBERCULOSIS

Joseph F. Wallace, M. D.
Woodmen, Colo.

At the present day the interpretation and diagnosis of Roentgenograms of the thorax is a fairly accurate science. Much labor and investigation has been done in the differential diagnosis of intra-thoracic lesions, and, with the assistance of the clinician and the laboratory, classifications of diseases of the chest are more accurately described. The diagnosis and classification of pulmonary tuberculosis were formerly done by the internist and bacteriologist; the work done by the Roentgenologist has only begun, so the knowledge added to medical science, though naturally increased, is still limited.

In the other branches of Roentgenology, as gastro-intestinal, genito-urinary and in bone studies, data has been furnished, not only of diagnostic, but also of prognostic value. This is because the pathology of these diseases has been more thoroughly investigated and the progress is less dependent upon physiological and extraneous causes.

Diagnosis and prognosis go together, and the internist who is the judge of the disease, must also be the prophet of the future and foretell the prognosis of the lesions. To properly interpret the disease, the Roentgenologist must not only be a pathologist, but must also be so skilled through experience as to fully understand and foresee the progress of these pathological lesions. He must be able to assist the internist, not only in diagnosis, but in determining the necessity, the kind of treatment proper in the different conditions, and, must also be able to judge from these lesions

the probable outcome of the disease. In no other disease are these qualifications so necessary as in tuberculosis. Because the advice given affects the treatment, sanatorium or home care, climate and the regime of life, which depends upon the type, the gravity, the location and extent of the disease.

In our work at the sanatorium prognosis is the chief issue. Business men with financial responsibilities, married men separated from their homes, young men with their whole future at stake, depend upon us for advice; and to them the prognosis is of vital interest. Diagnosis may be certain, but prognosis is the question which will affect their life, their residence and their occupation. Every case of tuberculosis is different; affected by the history, age, constitutional resistance of the patient, and the location, extent and virulence of the disease. We know that all of these affect prognosis. Study and knowledge of the symptoms and constitutional disturbances is necessary to the internist, and also has to be taken into consideration by the Roentgenologist. In the study of Roentgenograms we are not always supplied with this knowledge furnished clinicians, and we only deal with the character of the lesion itself, its extent, its location, and the involvment of the surrounding tissues. In this we have the means, the only resource to differentiate between the mild and the grave form of the disease, and by our interpretation determine the prognosis. Therefore, it is essential that a close relationship should exist between the Roentgenologist and the Internist.

In this paper submitted, our conclusions are based upon a thousand lung plates, and my purpose is to show the different types of tuberculosis, and in what type we can reasonably determine the prognosis. In general, the prognosis of an active case of pulmonary tuberculosis is bad. Fifty-one percent of all patients who come to the sanatorium are dead in five years. The mortality rate of the 245 patients

admitted to the sanatorium in 1908 is very high. Seventy-five percent of the active, open frank cases are dead; ninety-five, or thirty-eight percent, are living, but only thirty-five, or fourteen percent of those living, had active open lesions. Still, to say that this applies to all types of cases is misleading. Prognosis is only a relative affair in pulmonary tuberculosis. We should be impressed by the fact that the condition of well being, and the length of life, depends more on constitutional resistance than mechanical construction or pathological destruction.

Experience teaches us that the kind of tuberculosis lesions has much to do with prognosis. The location of these lesions, whether affecting the glands, bronchioles, pleura, the parenchyma or the different lobes, are all factors which assist in giving favorable or unfavorable prognosis.

Pathology: Early lesions, affecting the pleura, mediastinal glands and respiratory bronchioles, may progress rapidly, but this is an exception, and most cases, when they seek medical advice, are chronic, well advanced, and are really relapses instead of primary infections. The bronchial and peribronchial or hilus type do not have constitutional disturbances in adults and their illness is usually caused by other factors.

Prognosis in this type of cases is good, and it is rare for any adult with this type to break down and develop an open, frank pulmonary tuberculosis. Much stress has been placed on this type of lesion. We must, if truthful, be careful not to be too pessimistic in prognosticating the outcome of these supposed early cases of tuberculosis. Mistakes are justifiable on the side of safety, but pronouncing an individual clinically tuberculous, advising prolonged treatment and assuming the usual prognosis would be practicing an injustice not forgivable in a scientific man. In truth, we may assume that all lungs of adults are infected with tuberculosis, and, as we know, infection is in early life, but the kind, the gravity or significance of the lesions should be so understood

that prognosis will be correct in determining the course of life and the treatment suggested. We must distinguish between the active, clinical pulmonary tuberculosis and the obsolete type, which shows only by Roentgenograms in calcified glands near hilus, thickening of peribronchials or of the pleura. This type of cases should not be subject to prolonged treatment, as the lesion is closed and the prognosis is good.

The pathological changes in the tissue should be the guide for the interpretation of the plate. The very early tuberculous lesions are difficult to diagnose, and we should not always expect to find lesions in the thorax to explain or to agree with the constitutional symptoms. Although it is claimed that the limitations of the X-ray are many, and incipient tuberculosis cannot be successfully demonstrated, still we know that early lesions can be depicted, at least before irreparable damage is done. It is doubtful whether Roentgenograms can show early inflammatory changes with a proper acuteness, but in all cases with any systemic disturbance the lesions can be shown by Roentgenograms as thickening or shadows, the pathological changes which follow inflammation.

Physical examinations are often deceiving, and even by skilled operators, conditions are demonstrated which are in no way related to the pathological or tuberculous lesions. Doubtful findings, such as deficient expansion, heart abnormalities, bronchial shadows off hilus and mediastinal enlargement have their advocates to prove an early tuberculous infection, but, as a rule, not sufficient to warrant us to declare the prognosis bad.

In the study of disease certain factors are essential in making conclusions as to whether the results are favorable or unfavorable. In the final analysis prognosis depends upon the virulence of the infection, the resistance of the individual and the vitality of the organ attacked. In pulmonary tuberculosis the first two mentioned are uncertain,

and cannot be determined by physical means. The effect upon the vitality of the organ can be determined better by physical or mechanical help. The lung itself is an organ of many air spaces, lobules and lobes, so a destruction of one or more parts does not mean that the organ or its physical function is destroyed.

There are two general types of tuberculosis, acute and chronic. According to many the acute means the miliary tuberculosis, and according to others it means the early infections of the lung with the changes of inflammation. The prognosis in acute miliary tuberculosis is bad. All of these cases die. It usually means a general tuberculosis and the rapid dissemination in the lungs with sepsis assures an early fatal termination. The other type of acute tuberculosis is, in reality, the beginning or the early stage of inflammation, which is the incipiency of the chronic tuberculosis. The chronic type is the usual form which we consider in X-ray work, and is the only type that offers any hope for an arrest or a cure.

In this paper, I have explained, rather extensively, the early lesion and the pathology of the infection. This is a subject which is at variance with authors. Infection, as Kuss, Albrecht, Ghon, Hamberger and others maintain, is aerogenous, always occurs in childhood in the parenchyma of the lung; secondarily affecting the lymphatics of the bronchi and mediastinum; or as other writers maintain, first affects lymphoid tissue of the terminal bronchioles and secondary the lymph glands of the mediastinal and parenchyma of the lung. This question is of importance, not so much in determining diagnosis, but prognosis; because, plates showing parenchyma petrifications argue for a childhood infection, an obsolete closed tuberculosis, the kind which gives an acquired immunity. Pictures showing these petrifications, especially near the surface of the lower lobe, with no indication of recent activity mean a closed, nonclinical tuberculosis.

This is a point to be remembered when we consider the diagnosis or prognosis. When immunity is not sufficient or resistance lowered there is further extension of the disease with periods of activity and periods of quiescence; therefore, the patient rayed shows areas of healed foci and recent inflammatory changes, depending upon the periods of activity. The pathological descriptions of tuberculous invasions being correct, then all plates taken of adults prove that the disease was contracted in childhood, as all show a hilus or parenchyma involvment. In fact, practically all adults' chests, supposedly normal, show some tissue proliferation about the hilus. Less importance can be placed on adult chests of this type, for with fair resistance, prognosis is good. A slight glandular infection about either hilus, provided the superficial parenchyma is clear, gives a good prognosis in adults, because the localized foci ordinarily ward off general infections and establish immunity. Resistance of mankind is usually sufficient to prevent progress of the disease. Nature's method of preventing a tuberculous invasion and closing the activity of the lesion is by fibrosis and calcification. Suspected tuberculosis in cases referred to us with such lesions, shows fibrosis by physical examination, but constitutional symptoms or other evidence of activity is slight or absent. Observation after their discharge supports the view that this type of lesions offer a good prognosis.

In giving a prognosis of closed tuberculous lesions, even though showing a pathological infection, Col. Bushnell, in his articles on "Tuberculosis in the Military Service", draws definite conclusions. In his description of the types which he considers acceptable for military service, and those to be rejected, he gives the probable prognosis in these different types of lesions. In this article he classifies the kind accepted and rejected by Roentgenology. The types he considers acceptable for service are:

1. Tuberculous diseases confined to the region of the hilus in deep lung.
2. Extension upward toward the apex and downward and outward toward the base, confined to deep lung.
3. A fine line or two extending with or without small focus or foci, this condition not determined by physical signs.
4. Clouding of the apex with marked lines from hilus, probably largely pleuritis.
5. Well marked lines extending to the superficies of apex, usually, but not necessarily with foci there; lesion accessible by physical examination, which should determine the activity of the lesion.
6. (A) Lines extending toward the shoulder as well as apex, if confined to deep tissue, may mean early and not obsolete exacerbation.

The types that should be rejected for service, which offer a bad prognosis, are:

6. (B) Lines extending toward the shoulder, as well as apex, if extending to the superficies, denote larger lesions and less immunity than cases with well marked lines extending to the superficies of apex, usually, but not necessarily with foci there.
7. More or less widely diffused spots, lines and streaks through a considerable portion of lower lobe approaching periphery of lung, with few or no auscultatory signs; deep peribronchial tuberculosis.
8. More extensive streaked opacities involving greater part of one or both lungs extending to periphery with few or many physical signs; fibrocaseous tuberculosis, fibrosis preponderating in proportion to scantiness of more or less rounded spots or dots.

In determining prognosis of active pulmonary tuberculosis in the different stages, experience is the guide in making conclusions as to the gravity of the lesion and the results from complications. The Roentgenologist has to confer

with the Internist to ascertain the virulence, the kind of complication or the secondary infection, and the history of the patient with clinical data gives us a fair knowledge as to the virulence or the resistance. In general, tuberculous complications with their extension to other organs than the lungs, means a dissemination and gives a bad prognosis. Tuberculous extension in other organs, as urogenital, rectum, the ear, the eye or the bony system does not affect the mortality in increased proportion, and the life of the patient is judged by the amount of pulmonary activity.

Pulmonary tuberculosis, associated with peritoneal or intestinal tuberculosis, gives a bad prognosis.

Any further extension from the lung disease in the respiratory canal, as in trachea or larynx, offers a bad prognosis. A glandular enlargement, cervical or intra-thoracic, shows a fair resistance, and the prognosis is good, except in far advanced, ulcerative types of pulmonary involvment.

Any condition which shows an excess of calcium salts, as calcified costal cartilages, bronchioliths and other such deposits in the lungs, are indicators of past infections, which develop a resistance, and the prognosis in such cases is from fair to good.

The complications involving the pleura are many, and they directly affect the prognosis.

Pleurisy occurs in nearly all cases of pulmonary tuberculosis at some period during the different stages of the disease. This varies from the simple acute type with inflammation and congestion to the inflammatory serous type. Following the absorption, adhesions form, causing disagreeable symptoms and a partial limitation of motion, which, though well defined by Roentgenograms, do not indicate a grave outcome. Increased shadows from the pleural thickening or bands rather seems to favor resistance, fixing, as they do, and limiting the motion of the active tuberculous lobes.

Serous pleuritic effusions, occurring during the course of

an active pulmonary tuberculosis, usually on the affected side, gives a favorable outlook for improvement.

Empyema, following such effusions, lowers the resistance and offers less hope for an arrest.

Spontaneous pneumothorax, since the introduction of Roentgenogram technique, are more frequently reported in tuberculosis than before its advent, and partial pneumothorax is rather common in far advanced cases.

The partial circumscribed type, occurring in the upper or medium portion of the lungs, is usually walled off by a thickened pleura, and is not of grave significance. A complete spontaneous pneumothorax gives a bad prognosis, and even when properly treated, offers only a fair chance for a limited extension of life. The pyo-pneumothorax, following, is a grave complication and even when circumscribed and surgically treated rarely ever makes improvement.

Mixed and secondary infections in the bronchi and lungs, pneumonicosis and fungi infections, occurring with pulmonary tuberculosis, give a bad prognosis.

In chronic tuberculosis, affecting solely lung substance, a reasonably definite prognosis can be ascertained by determining the following:

First: The lobes affected, the location and amount of involvment.

Second: The type, the virulence and the infection of the appendages.

Third: The chronicity of lesions and the evidence of healed foci.

Fourth: The demonstration of destruction of lung substance and the various mechanical obstructions.

Tuberculous infiltration does not show clear lung tissue by a roentgenogram, even after the arrest of the disease, but will depict shadows thicker and better defined, showing the result of fibrosis.

Involvment in one apex, even with a hilus and peribron-

chial thickening, offers hope for an arrest. When the involvment affects the entire upper lobe of either lung the hope for an arrest is good. Further extension in the lower lobe lessens the chances for an arrest, but usually by this time some fibrosis has developed in the other lobe. True unilateral cases of tuberculosis are rare, and when marked involvment is found in one lung, signs of infiltration and beginning destruction of tissue exist in the other. The selective action in either lung of the primary involvment of tuberculosis is disputed, but the right lung seems to be the more preferred.

Bi-lateral involvment of both lungs, showing activity in both upper lobes, offers little hope for an arrest. Lower lobe involvment alone, or associated with the other lung involvment, gives poor prognosis, although a few of our cases showed improvement.

Scattered involvment in patches throughout one or both lungs shows a rapidity of destruction and poor resistance. Fibrotic areas in localized and unilateral cases offer better prognosis than the scattered forms, but arrests may occur in this type.

A consolidated lung with contraction from collapse develops fibrosis and resistance, unless the other lobe shows an infiltration. Our far advanced cases making improvement show a far greater percentage of right sided involvement than left side of the same degree. A relapse, with invasion in the new lobes, especially in the opposite lung, reduces the chances for improvement. This is especially true in chronic cases with a recent left lung involvement. Our statistics demonstrate that left lung extension offers a bad prognosis.

Our observations in this paper and the conclusions we have drawn from the slides exhibited are not arbitrary or final. We hope it may add something to the knowledge of this work; that it may stimulate others to investigate these

studies and go farther in perfecting and developing more accurate data in the Roentgenology of the thorax.

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Dr. W. H. Watterson, Chicago (Medical Supt., Municipal Tuberculosis Sanitarium): I was very much interested in Dr. Wallace's paper and he has had an excellent chance not only to study the cases clinically and under the X-ray, but has had almost unlimited opportunity of following up the cases, which seems to me very important. I was glad to have him give some idea of the Turbin classification and I wish that the National classification of tuberculosis could be brought out at such meetings as this.

I consider that the tuberculosis patients are divided into four classes, those who have tuberculosis and never know it and get well; there are many cases which are never recognized unless by some accident we get to see into the chest and see the evidence. The second class consists of those who have tuberculosis and get well no matter what is done. The patient goes ahead with his work, takes a sea-voyage or vacation and gets well. The next is the class that positively must go to the sanitarium and take the extreme care that Dr. Wallace is giving his patients in order to get well. The fourth class consists of patients who, no matter what is done, are going to die. Dr. Wallace I am sure will agree with me that neither he nor I nor anybody else can say which cases belong to class one, two, three and four, and it is our duty to advise every patient with tuberculosis diagnosed to go to a sanitarium to give him the best chance to get well. There are those who belong to class four on whom you must not expect the sanitarium to have any effect. They will not get well.

I am very glad to use and see used in our institution the X-ray as corroborative evidence of other findings. However, for diagnostic purposes in the advanced cases I consider it only of slight value. It is a satisfaction to the men to know that their findings of cavities are verified, or whether there are carcareous deposits, but the clinical findings are the important things and in the advanced cases of tuberculosis it is of relatively little value except to satisfy this curiosity.

In the cases of early tuberculosis it has its place. The peculiar appearance of smoke, or as it is sometimes spoken of, a triangle, or cone—or whatever it is, is there and is an evidence of early tuberculosis. I differ a little from Dr. Wallace as to his idea of primary focus and secondary focus in the adult. I think I can show you in our institution a number of plates where there is evidence of primary focus in the child and a secondary one in the adult. When-

ever you get that primary focus which has healed and a secondary one in the adult there is a case where you can make a fairly good prognosis. Why? I think Opie of St. Louis brought this out in two numbers of Experimental Medicine, I think the last June and August issues. He brought out the fact that he had found that in the primary focus of childhood which healed—and they had healed if they lived after the second year—that the resistance of that patient to tuberculosis was increased to a large extent. The idea was that a primary focus in childhood, healed, gives increased resistance against tuberculosis in the adult. In an article which was printed in the Illinois Medical Journal, February '15, I made this statement—"If we were able to measure the dosage and the amount of infection it might be a wise thing to infect every child with tuberculosis that we might have the resulting resistance to adult infection." I can show you in a series of plates that practically every case where we get the shadow of primary focus in childhood, healed, that the adult secondary infection has an entirely different course and the prognosis is always better than where the primary infection occurs in the adult. It takes a different course. The primary drains to the hilus always and the secondary infection drains to the periphery always. I can show you plate after plate that will show this. Just why I do not know, but it occurs and I think the great thing as to the X-ray in prognosis of tuberculosis is the bringing out of that one point,—that evidences of childhood infection healed gives a better prognosis for a secondary infection in the adult.

Dr. B. H. Orndoff, Chicago: This paper was intensely interesting to me. Our essayist has every opportunity in his observation of cases to qualify himself to give us the best possible in this line. His paper was the evidence. In discussion, I would like to say that the fluroescent screen in my hands has been of very little value in detecting minor changes in the lung parenchyma.

In speaking of the lesions described as the earlier lesions of tuberculosis, I might add that the lesion in the child which is the reaction of non-sensitized tissue to inoculation with tubercle bacilli is very different from the lesion in adults. In the adult the tissues are sensitized and the lesion that is recognized most early is probably the cone or fan shaped lesion described by Dunham. One of the most valuable points in roentgen diagnosis is the detection of early lesions of tuberculosis.

Before closing, I wish to state that I would not think of dispensing with fluroescent screen observations in tuberculosis. I believe by this method of checking the character of the lesion of the lung, one is in a position to follow the case more closely from the therapeutic standpoint.

Dr. Jos. F. Wallace, Woodmen, (Closing): I wish to thank the different physicians who brought out some of the points I overlooked. I use the fluorescent screen to good advantage, as Dr. Orndoff suggested. First, we make the stereo-roentgenograms, and for the most part, they are rather typical and very satisfactory.

The object of the paper was to show what the prognosis was in the different types of cases, and I went very lightly into the pathology of the disease. Dr. Orndoff gave a very good description of the pathology. In speaking of the cases that are open, and the cases that are closed, I have copied from our records in 1909, we discharged 328 cases that year. We have a larger capacity now. In 1909 I did not have the X-ray equipment, but I judge that the cases now run just about the same as they did then. From the discharges in 1909, I took this report from the bacteriological department; the number now living, who had a positive diagnosis, is eighty-three; the number living whose sputum was negative eighty-one; died, positive, 149; negative 15. Practically all of these cases, deducting perhaps 10 per cent, had sufficient lesions to warrant their remaining at the sanator-

ium. This means that they had tuberculosis, altho there were no bacilli in the sputum at different examinations. Twenty-five per cent of those with tubercle bacilli are living; seventy-five per cent are dead. Of our ninety-six cases with no tubercle bacilli eighty-one are living after seven years. In looking over the causes of death of the fifteen we find only four who died of pulmonary tuberculosis. The rest died from various diseases, as, cancer, nephritis, heart disease, etc.

In making any conclusions, the case that is closed, and has no tubercle bacilli in the sputum, I would say has a good prognosis. I do not believe in being too pessimistic, and declaring these adults as actively tuberculous and scaring them. It's all right to give them advice, and I think their prognosis is good if given any reasonable care and advice. The prognosis is never good in any active case, without care and treatment. Within a few years they will invariably die. You may remember individuals who have gotten well, but they are not numerous. It looks like a sort of hopeless task to fight tuberculosis in these cases after we get them at the sanatorium. The work should be done long before we get the patients. We spend our money in helping them for a time, and in bringing a few back to health, but it is rather discouraging to look back seven, eight, or nine years and see what has happened to these ex-patients who had active tuberculosis.

DEEP ROENTGEN THERAPY

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Mr. Chairman, Members and Visitors: It is my intention to present to you under two headings:

1st. A Preliminary Report with regard to technique in treatment of malignancies of the lower lip.

2nd. A graphic Outline of fifty cases of post operative cancer of the breast, grouped and classified with regard to the most prominent and vicious symptoms with which we have to deal.

Technique in Initial Epithelioma of the Lower Lip

This condition is usually considered superficial but should be classed definitely under the deep roentgen therapy group. Some of them even to the post-operative therapy group.

During the first five years of my work I treated superficial epitheliomata of the lower lip with raw fractional doses, only treating the cervical glands when metastasis was evident.

During the next period of, possibly seven years, having evidence that the surgeon gave a larger percentage of cures, I tried to have them all operated and followed by a post-operative X-ray.

During the past five years I have shown a returning inclination, under improved technique, to again roentgenize the majority, if not all, realizing that those which required surgery were often almost hopeless to begin with.

Almost all malignant growths of the lower lip, when broken down with the X-ray, develop a sub-mental gland.

Sometimes this phenomena is only a manifestation of infection from debris, sometimes an actual malignant metastasis.

Differentiation between these two manifestations is not always possible.

In this report I wish to again call to mind that this is an unproven technique and only has two cases to its credit.

The initial growth on the lip is left undisturbed. Two or three filtered, massive, crossfire doses are administered to the cervical and subclavicular region, (both sides of the neck) within a period of three to six weeks. When epilation is manifest and the erythema begins to subside, then the growth on the lip receives raw ray sufficient to produce an active necrosis in a period of three to four weeks (usually less). (This may be given fractionally to avoid sudden and severe reaction.)

Two bilateral, crossfire, filtered, massive doses shall be administered to the neck during this period (it being preferable in experienced hands to maintain a slight erythema in the neck throughout the period of lip necrosis.)

As a precautionary measure we often repeat with a smaller dose or two during the period of healing.

During the initial effort to destroy the cervical glands we may find the Primary growth on the lip has increased materially in size but it is nevertheless ignored. The factors that influenced me in inaugurating this technique are as follows:

1st. Glands that are overworked carrying infective material offer poor defense against metastasis.

2nd. Epithelial growths of the lower lip unless traumatized are usually slow to metastacise.

3rd. If metastasis has positively occurred prognosis should be extremely guarded. (In this connection bear in mind the extreme prevalence of cervical adenopathy, all glands in lip carcinoma are not cancer).

4th. Nearly all malignant and fungoid lesions are easily destroyed locally.

5th In the two cases thus treated there were no infective submental or other glands manifest during or after the necrotic stage, which phenomena many of you know are often observed. (In parenthesis I may add that the days of ''snip'' for microsopic section of lower lip cancer have long since passed, although a Wasserman is made under the slightest provocation.)

The next portion of this deep therapy subject deals with

Fifty Post-Operative Breast Malignancies

It is needless to say that the majority of breast malignancies referred for deep roentgen therapy are referred with more or less misgivings on the part of the surgeon.

The degree of efficiency obtained by the surgeon I believe is best shown under Greenaugh's statistics of a large number of cases which gives the percentage of cures listed under the pathological varieties, viz.: medullary 16 per cent, scirrhous 23 per cent, adeno-carcinoma 47 per cent, Padgets 12½ per cent, carcinoma of the lactating breast 28 per cent.

The most favorable prognostic report of any considerable number of cases is shown in Halsted's 75 per cent of cures surgically in adeno-carcinoma..

Roughly the character of cancer giving a favorable prognosis surgically gives a correspondingly favorable prognosis under röntgen therapy, but this is not invariably so as shown by Holding in *American Journal of Roentgenology,* April, 1917.

He shows the best results in roentgenized growths to be in lympho sarcoma alveolar carcinoma of the breast and adeno-carcinoma.

We are familiar with the fact that rapidly growing sarcomata and some of the rapidly growing mixed tumors give uniformly bad results, irrespective of the means used.

Authentic statistics of the past decade confirm an added percentage of cures as the ray is intelligently utilized.

This is especially true regarding lympho sarcoma, adenocarcinoma of the breast, scirrhous and Padgets.

Much statistical data is available relative to the number of cures classified under the several cell pathologies, under different ages and some reports classified under supra clavicular and axillary involvements.

Laboratory reports are not always obtainable from referring physicians.

The character of operation is always evident and of no great moment, roentgenologically.

The factors present of active interest are, age, degree of metastasis, rapidity of onset, evidences of lung or lymph odema, cellulitis and the presence of excessive fat.

Occasionally one is interested in evidences of pre-operative treatment; i. e. paste, cautery and X-ray.

Cases tabulated with these facts set forth, contain for the roentgenologist much of interest and when compiled with data of end results answer the ever pertinent question relative to what experienced operators are accomplishing.

Under this miscellaneous list of post operative breast malignancies, observed over a period of three to six years, it is my purpose to bring to your notice and classify in columns some of these more striking phenomena that are manifest.

Some of these symptom phenomena are common to several varieties of cancer and are of more concern roentgenologically than the character of malignant cell, both as to technique, character of treatment and accuracy of prognosis.

I have shown you under the first heading

	Present	No Improvement	Improved	Symptom Free
Lung oedema (easily differentiated from metastasis on roentgenogram)	2	2	0	0
Cellulitis	16			
Lymph odema		9	6	1
Cases of rapid onset	9	5	4	0
Excessively fat patients	13	10	1	2
Pre. op. X-Ray	4	1	1	2
No metastasis evident	10	0	0	10
Metastasis evident	33	13	13	1
Percentage		34	30	36

77 vicious factors evident in 50 patients.

The Lung Odema column shows two cases uninfluenced by treatment, rapidly fatal.

Diffuse Cellulitis, 6 cases, two improved, cured 0.

Lymph Odema, 10 cases, five improved, cured one, 2%.

Fat Patients, 13 cases, 3 improved, cured two, 4%.

Rapid Onset, manifest in 10 cases, (relief of pain) doubtful improvement in 2, cured 0.

Metastasis Manifest, 33 cases, 12 cases improved, cured 7, 14%.

Absence of Foregoing Manifestations in 10 cases, cured 10, 100%.

Pre-Operative Fractional X-Ray, 4 cases, cured 3.

Sum total percentage, 34% dead, 30% improved, 36% well.

The obvious futility of agents other than radio-active in combating many of the foregoing phenomena, should stimulate more earnest and careful effort along this line of endeavor.

A standard chart of record which includes more than the age, sex and pathologist's report would unquestionably establish some added data of value in prognosis.

I mention pre-operative X ray because I have gone on record repeatedly as opposed to it, fearing that relief from symptoms might influence patients against the universally accepted advantage of combined, heroic treatment, although convinced that in the slower growths it has much to commend it.

Even if we disregard the evidence of the increased number cured of these surgical discards we still have with the surgeon a coöperative interest in the relief from many of the loathsome manifestations, relief of pain and many times a much needed earning capacity.

The obvious futility of agents other than radio active, in combating many of the foregoing phenomena should stimulate earnest and careful efforts both in technique and statistics.

A more universal record chart, with more data than the age, sex and tissue report might include to our advantage the extent and character of the few most important symptoms and prognostic factors encountered.

DISCUSSION

Dr. M. B. Titterington, St. Louis: I have always advocated treatment before operation, not so much on account of its effect on the tumor itself as for its effect on the lymph circulation as a preventative of metastasis afterward. I have not very often been able to convince the surgeon of this and get him to let me carry out the treatment, but in the few I have treated in this way I believe they have recovered sooner and I think I shall continue advocating the same thing.

Dr. O. H. McCandless, Kansas City, (closing): I wish to warn those who have not been in the work very long

against swallowing all the results reported, perfectly whole. After you have been in the treatment longer you may be able to give us results which will be of some benefit. The most striking thing is that we have increased our old recoveries from 25 to 36 per cent. If we can do that in fifty known cases we have probably done it in a hundred cases on which I may be able to give statistics later. The statistics may be forthcoming some day to establish the fact that we can increase the ratio in the number of cures accomplished. We have very little to offer, but it is my hope that this organization will furnish a large number of statistics in the future.

ARTERIOMESENTERIC OCCLUSION OF THE DUODENUM

(''Chronic Dilatation of the Duodenum'')

By Wm. Engelbach, M. D.
St. Louis, Mo.

This subject was chosen as particularly applicable for discussion before this Society for the following reasons: (1) Even by those especially keen in diagnosis, chronic dilatation of the duodenum, a very severe and sometimes fatal disease, is usually unrecognized. (2) Roentgen examination, if properly carried out, should make the diagnosis in every case comparatively easy and absolute.

Duodenal dilatation can be conveniently divided into two groups,—the acute and chronic. The acute dilatation has become well known under the name of ''acute dilatation of the stomach,'' following abdominal operations. The chronic dilatations of the duodenum are reclassified into two subdivisions: (a) those due to organic stenosis (1) in the duodenal wall, such as ulcer, or (2) about the duodenum,

as adhesions, tumor, etc.; (b) mechanical occlusion of the duodenum produced by traction of the root of the mesentery. It is this type, chronic incomplete occlusion of the duodenum, due to compression by the arteriomesentery, to which this paper directs your attention. Acute obstruction of the duodenum, or that due to an acquired lesion, such as ulcer, tumor adhesions, etc., will not be included.

Various synonyms for this condition exist in literature. Vanderhoff has recently written an especially clear clinical exposition of this disease, with a complete bibliography, under the subject of ''Dilated Duodenum,'' with the special reference to chronic duodenal obstruction in visceroptosis. Glenard (1889) and Kundrat (1891) described this condition under the title, ''persistent incomplete obstruction of the duodenum with gradual dilatation of the duodenum and stomach.'' Schnitzler (1895) described the condition as ''compression of the duodenum, associated with lordosis.'' Albrecht (1899) named the condition ''constriction of the duodenum, due to mesenteric traction.'' Bircher (1906) has described it under the name of ''duodeno-jejunal ileus.'' Connor (1908) used the term, ''obstruction of the duodenum with visceroptosis.'' Bloodgood (1912) reported seven cases under the title of ''dilatation of the duodenum in relation to surgery of the stomach and colon.'' Jordan (1912) gave the first roentgenographic description, one of the most classic, under the title of ''duodenal dilatation complicating ileal stasis.'' Anders (1912) described this condition under the name of ''stenosis of the duodenum,'' without separating it from other organic lesions, such as ulcer, producing duodenal obstruction. Melchior (1914) gives it the name of ''arteriomesenteric occlusion of the duodenum''.

We define this condition then as a chronic dilatation of the duodenum, due to an intermittent incomplete constriction of the duodenum from pressure of the superior mesenteric artery and mesentery against the body of the vertebra.

This mechanical cause is supported by the majority of investigators as the etiology of this disease. Albrecht's original explanation, later confirmed by Codman, was that this pressure is due to simple constriction of the mesentery in the so-called enteroptotic type of individual. Schnitzler believes that deformity of the vertebra, such as lordosis, is a very important factor in its production. Bloodgood thinks that a distended cecum is the important change which produces the pull upon the mesentery. Jordan has attempted to prove that this is merely a complication of ileal stasis. He says that when the terminal coil of the ileum becomes overloaded and slow in emptying, they fall into the pelvis, producing the necessary drag upon the mesentery. Barber does not believe that the mechanical factors alone are sufficient to produce this obstruction. He thinks that both the ileal stasis and the obstruction of the duodenum are due to neuro-musculature reflex. Frank believes that in children, upon whom he has demonstrated two cases, this is due to a congenital atresia. Turk does not believe either in the mechanical or the neuro-muscular reflex cause for this condition. He has attempted to prove that the atonic dilatation is due to a biologic cause, such as the toxic effects of digested proteids upon the wall of the intestine. He says that the work of Whipple and Hartwell, in intestinal obstruction, has confirmed his theory. Summing up all this evidence, the fact remains that there is a partial intermittent obstruction of the duodenum at its jejunal junction, and the most convincing evidence with regard to the etiology has been the relief which these patients have obtained by proper surgical procedures to overcome this obstruction. Stavely (1910) and others since then have obtained complete relief of all symptoms from this condition by duodeno-jejunostomy. Other operators have obtained very favorable results by simply widening the duodenal slit in the mesentery. Bloodgood has obtained complete relief by resection of the right half of the colon.

While this condition is thought to be very rare and unusual, it is more than likely much more common than we suspect. The mere fact that we are unacquainted with its manifestations would account for its statistical infrequency. Unquestionably, it is being overlooked and treated for other abdominal and nervous diseases. It is almost invariably the experience of every one who has become even partially acquainted with the syndrome, to admit that the first case recognized was observed either at autopsy or operation. Many operators, not familiar with the findings, do not yet recognize these dilated duodenums during operation. This occurred in the first case that we report in this paper. Vanderhoff's first case was recognized at autopsy. Upon this case he reports the following opinions from men in different medical fields who had observed the case: (1) Family physician—"chronic cholecystitis." (2) Consulting neurologist—"If you can exclude gall bladder disease, I think her emaciation and vomiting can be accounted for by hysteria." (3) Consulting surgeon—"no obstruction, no surgical lesion, some underlying toxemia, possibly pellagra." (4) Medical attendant—"visceroptosis, persistent vomiting, of undetermined origin, starvation, acidosis." Finney, many years before he reported his first case, had observed many large, dilated duodenums at operation, without attempting to treat them. Bloodgood says he recognized his first case during the course of an exploratory operation. The obstruction was not relieved, and patient came to necropsy twenty days afterward. Cyclic and hysterical vomiting, chronic cholecystitis, chronic appendicitis, ulcer of the stomach and duodenum, floating kidney, and in children, acidosis, are some of the present day diagnoses upon which these cases are being treated. Undoubtedly, many of these cases are passing undetected through the hands of the roentgenologist, as readily as they pass the surgeon, the clinician, and the general practitioner. There is possibly some excuse for the mistake in diagnosis for

those who do not use fluoroscopic examination as an aid to diagnosis. The roentgenological picture, on the other hand, is so objective and definite that these cases should no longer be overlooked. On the contrary, many should be diagnosed from the fluoroscopic examination alone.

The important roentgenological findings in these cases, from our experience, have been (a) an eighteen to twenty-four hour duodenal residue in the terminal (second and third portions) of the duodenum, with negative evidence for other lesions (ulcer, tumor, adhesions, etc.), or (b) the objective demonstration of a large, dilated duodenum, including its second and third portions, as described below. In some of the cases there is a distinct duodenal residue, remaining six or eight hours after the barium meal. This residue is usually in the third portion of the duodenum, frequently mistaken for a barium plaque in the hepatic or transverse colon. After the patient has received the aqueous solution of barium, it is easy to determine the location of this residue by observing the barium pass directly out of the stomach down along the course of the duodenum to the residual shadow previously observed. Twelve, eighteen, and twenty-four hour fluoroscopic observations are then made to determine the length of time that this residue remains in this portion of the duodenum. An eighteen or twenty-four hour duodenal residue, particularly in the third portion of the duodenum, is very suggestive in itself of a constriction or compression of the duodenum at this point, as it is seldom that an organic lesion is located in this portion of the duodenum. This residue has been found in two of our cases without an accompanying six-hour gastric residue. More important than this residue finding is an actual objective demonstration of an enlarged, dilated duodenum. Our technic for demonstrating this is as follows. With the patient before the vertical fluoroscope, after the aqueous solution of barium is given, and before the second buttermilk meal of barium is taken, the terminal portion of

the duodenum, the location of which has been determined by watching the barium pass through it, is constricted by pressure of the left hand against it and the body of the vertebra. The remainder of the duodenum is then filled with barium by grasping with the right hand the antrum and pyloric end of the stomach and milking its contents into the duodenum. In a great majority of these cases who are not too large or who have not too thick abdominal walls, this procedure allows the duodenum to be filled throughout its entire course and helps to visualize its second and third portions. A normal duodenum, as you know, has the densely opaque triangular cap with a constricted second and third portion, having wavy markings of the conniventai folds. In these dilated duodenums we find (1) that the duodenum presents a very large, wide, evenly dense sausage-shaped shadow throughout its three portions, and (2) that there is an absence of cap and conniventai markings. This large, uniformly opaque, equally wide shadow, from the pyloric sphincter throughout all three portions of the duodenum, without differentiation of cap or valvulae conniventes serrations, is sufficient in itself to identify this disease. Taken with the negative roentgenological evidence for gastric and duodenal ulcer, the negative history for gall bladder and appendiceal diseases, and the history and habitus of this condition, both the positive and differential diagnoses are satisfied. The absolute demonstration of ileal stasis or of a mobile, dilated cecum, we do not believe is necessary in these cases if one has the decided objective roentgenological evidence of dilated duodenum. It is difficult to get plates of these cases, for the reason that it is necessary to digitally compress the distal duodenum in order to observe its contour when completely filled.

With regard to the clinical syndrome, those given by Vanderhoof are classical in most cases. They are as follows:

(1) "Persistent or recurring vomiting. In most in-

stances the vomitus contains bile, often in a considerable quantity.

(2) ''Pain in the upper part of the abdomen, generally referred to the right hypochondrium. As a rule, this is described as an aching or dragging pain, but it may be severe, so as to suggest biliary colic, or in other instances, it simulates the pain of peptic ulcer with irregular food relief. (It frequently closely imitates appendicitis or renal colic.)

(3) '' 'Habitus enteroptoticus,' often associated with exaggerated lordosis.

(4) ''Obstinate constipation is the rule, although this may not be a feature of the case. Occasionally the stools are colorless and relatively free from bile.

(5) ''Vague toxic symptoms, headaches, neuralgia, etc.''

Case reports giving types showing duodenal residue (1), and roentgenological picture of dilated duodenum (2):

REPORT OF CASES

Case I. Miss B. N., age 17, General No. 364, Service of Drs. Engelbach & Tierney, St. John's Hospital, 1916. Chief complaints as follows: (1) Pernicious vomiting, usually in relation to intake of food, at times, however, bearing no relation and having very acid, bitter taste. (2) Marked loss of weight, more than sixty pounds in the past three years. (3) Almost daily headaches. (4) Weakness. (5) Immediately after eating, dull pain in epigastrium, accompanied by tender spot size of dollar. (6) Marked sense of distention and fullness, considerable eructation, followed by vomiting, vomitus containing bile and producing complete relief of pain and distention. (7) Vomiting, occurring daily during one year.

Course: (a) Onset. Sudden. (b) Progress. Above chief complaints almost daily present, not associated with fever, jaundice or any signs of infection, chills, sore throat, etc. Appetite always good.

Past and family history negative. Personal history negative with exception that menstrual history was normal until few months after onset of present symptoms, when amenorrhea occurred and was present up to the time of examination.

Examination: Physical was negative with exception of typical so-called enteroptotic or enunchoid habitus, height five feet eight inches, weight one hundred twenty pounds (maximum had been one hundred seventy-five pounds). Laboratory findings were all negative with exception of a considerable amount of acetone in the urine. Stomach analysis: Ewald test meal, removed in one hour, large amount of bile, mucus negative, blood negative, free H. Cl. 25, total acidity 48, microscopic examination negative. Feces was negative for blood, ova, etc. Blood examination normal throughout, including Wassermann and blood retention products (urea, uric acid, creatinine, sugar, and CO_2). Roentgenological examinations of the head and chest were negative. Fluoroscopic examination of the stomach showed a duodenal residue remaining in the third portion of the duodenum, eighteen to twenty-four hours, on different observations. Colon showed a very slight spasticity.

Course: Patient was treated for acetonuria and spasticity of the colon for six months, without benefit, then given a complete reëxamination, which practically confirmed the above findings. Patient was then operated on by Dr. Amyx. Report of exploratory operation: Stomach and duodenum were free from any evidence of ulcer; gall bladder and appendix were also absolutely normal; cecum was not dilated, slightly mobile. Pelvis was free from all abnormalities; uterus normal size, tubes and ovaries macroscopically normal. The only positive finding was a large duodenum, with a very few enlarged lymph glands at the duodeno-jejunal junction. The duodenum was separated from its base so as to be turned over and examined very carefully posteriorly

for ulcers, and the stomach was inverted and gone over extremely carefully, with negative findings. A slit was made in the duodenum in order to pull it from the ligament of Trietz and to explore the jejunum, which was found absolutely normal. A large slit was made in the ligament of Trietz, liberating the duodenum in both directions. Lymph glands were removed for a microscopic examination. Histological examination of these glands proved them to be free from evidence of infection, merely showing a hyperplasia. The abdomen was closed. Future course for one year following operation: Patient made an uninterrupted recovery, did not vomit during the remaining three weeks in the hospital. Feeding was forced after the sixth day. After leaving the hospital, the patient had a very occasional slight attack of vomiting (one in three or four weeks), gained weight rapidly, and two months after the operation was able to resume work in a wholesale store and continue same with only a very occasional slight attack of vomiting to the present time.

Case II. Mrs. A. C., age 33, General No. 3343, Service of Drs. Engelbach & Tierney, St. John's Hospital, 1917. Chief complaints: (1) Dull, aching pain in right iliac fossa, accompanied by some epigastric fullness and distress, very rarely regurgitation of food, no vomiting or nausea, no pyrosis or eructations except during typical interval attack. (2) History of two severe attacks of marked distention of the abdomen, associated with persistent vomiting for from eight to twelve hours, not associated with temperature or jaundice. Tenderness over abdomen, more intense in right iliac region. (3) Constant scotomata in form of floating particles, not associated with nausea, vomiting, or headaches.

Duration: Six years. Course: (a) Onset. Gradual. Commenced with anorexia, physical weakness, loss of weight, epigastric fullness, sense of stricture in neck, some nausea, occasional acid regurgitation, no eructations, pyro-

sis, or vomiting. (b) Progress. Following this onset, patient had a very severe attack of abdominal distention, associated with nausea and persistent vomiting for twelve hours, not accompanied by temperature, jaundice, or severe pain. Patient complained of diffuse abdominal tenderness, somewhat localized in the right lumbar region, both anteriorly and posteriorly, no urinary disturbances. Patient was in the hospital for three or four weeks, and was seen by a number of consultants, medical, surgical, and neurological. Different diagnoses of gall bladder disease, appendicitis, and floating kidney were made. An agreement could not be reached with regard to surgical procedure. After three weeks in the hospital, she recovered from the most severe symptoms, but has not been free from variable abdominal symptoms since then. Dull, aching pain and tenderness in the right iliac fossa, has been more or less constant. She is, however, conscious of shifting gas and passage of flatus, and bowel movements produce transient relief. Enema produces temporary relief at times, no blood, but small amounts of mucus rarely noted in stools. Three years following this, patient had a very severe attack of colic, which was general over the entire abdomen, not localized distinctly in any region, sufficiently severe to require morphine. This was not associated with vomiting, nausea, jaundice, or temperature, but there was a distinct amount of abdominal distention. Following this second attack, vague abdominal distress and discomfort have been present. Numerous consultants have given various opinions. Treatment for ptosis and abdominal support has increased her symptoms. Patient states that she is very decidedly relieved in the upright position, her symptoms being very much exaggerated when she lies down. She has never tried the abdominal or dorso-vertical position for sleep; supine position on the right or left does not affect symptoms.

Examination: Physical showed typical eunuchoid, enter-

optotic individual, five feet seven inches tall, weight one hundred twenty pounds. Regional findings were practically negative with exception of palpable right kidney. Laboratory findings: Urine, blood, and feces were normal. Stomach contents were normal with exception of low acidity, probably due to amount of bile and pancreatic secretions in the stomach contents (total acidity 15, free H. Cl. 10). Roentgenological examinations, head, neck, and chest, were negative to fluoroscope and plate. Fluoroscopic examination of stomach, taken from records: "About one-third of six-hour meal gastric residue. Remainder of meal in cecum and ascending colon, cecum very low in pelvis, freely mobile, appendix shadow not visualized. Stomach very large and low, greater curvature reaching level of symphysis, very freely mobile, fish-hook type, free from filling defect, incisura, niche, and bud, no anterior-posterior projection of barium. Cap made out on manipulation before the aqueous solution of barium was given. Following aqueous solution of barium, cap made out, very smooth, even, triangular in shape, free from defects. By compressing duodenum and milking stomach into it, duodenum was demonstrated. It was at least three times size of ordinary cap, duodenal shadow over two inches in width and almost six inches in length, second and third portions of duodenum very easily visualized, filled out smooth, same width as cap, no evidence of conniventals shadows, very dense, diffuse, making a rare sausage-shaped shadow, extending from the pylorus down around, meeting the vertebra in the median line."

Diagnosis: Chronic dilatation of the duodenum, due to arteriomesenteric occlusion.

Treatment: The treatment of these cases naturally divides itself into the medical and the surgical. Medical treatment is indicated in a few of the less marked cases. This consists of prolonged rest, forced feeding, the knee-chest position (fifteen minutes in two hours), abdominal or left side supine position, and gastric lavage for frequent re-

filling of the stomach. In the majority of these cases when the duodenum is markedly dilated or the stomach secondarily involved, as demonstrated by the fluoroscopic examination, surgical intervention is indicated. It is necessary to emphasize the fact that gastro-enterostomy, as ordinarily performed, does not relieve this condition, but usually intensifies it. Some operators have succeeded in relieving the symptoms entirely by widening the duodenal slit in the mesentery. Most cases will require a duodeno-jejunostomy.

We wish to emphasize in conclusion that arteriomesenteric occlusion of the duodenum is a well established clinical entity. Its diagnosis lies almost entirely within the scope of roentgenology. Its relief can be accomplished in the majority of cases by proper surgical treatment.

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6. Codman: Boston Med. and Surg. Jour., 1908, 158, 285.
7. Connor: Am. Jour. Med. Sc., 1907, 133, 345.
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10. Jordon: Brit. Med. Jour., 1912, 1, 1225.
11. Kundrat: Ueber eine seltene Form der inneren Incarceration; abstr., Wien. med. Wchnschr., 1891, 41, 351.
12. Melchior: Berl. klin. Wchnschr., 1914, 51. No. 38; abstr. The Journal A. M. A., Oct. 31, 1914, p. 1611.
13. Schnitzler: Wien. klin. Rundschau, 1895, 9, 579, 593.
14. Stavely: Surg., Gynec. and Obst., 1910, 11, 288.
15. Turk: A. M. A. Jour., Vol. LXIX, No. 7, p. 515.

16. Frank: Zeitschr. f. Kinderh., 1913, 9, 99.
17. Vanderhoff: Dilated Duodenum. A. M. A. Jour., Vol. LXIX, p. 510, No. 7.

DISCUSSION

Dr. I. S. Trostler, Chicago: The subject that Dr. Engelbach brought up is of considerable importance because if you can't make that diagnosis you are not going to help the patient. In the cases I have seen, all have been women, they have all been thin and have all had night pain, a one o'clock pain. I want gloves and I want a good long wooden spoon; I compress the duodenum with a wooden spoon; I have a Holzknechts dipper with which I manipulate around the screen, at the same time compressing with the wooden spoon, and I am glad to say that after working for many years with the X-rays I still have the hairs on the back of my hands and have no burns.

In most of the cases that I have seen instead of having the duodenum turn over toward the patient's left, that is to my right as I face the patient, in this type of case every one with a large duodenal loop has passed to the patient's right and to my left. Whether change in the anatomy is the cause of that, I am unable to say, but it has been my experience, and in the few cases I have seen opened up that was the condition found. I am satisfied that those of you who do fluoroscopic work on the abdomen will find these cases. In the cases where the surgeon or internist refers the patient to you where he thinks there is a gastric ulcer element in the case without the true findings clinically, they will prove to be this type of case occasionally.

The subject has been very well brought out by Dr. Engelbach and I think we are to be congratulated on his exhaustive, instructive and very valuable contribution.

Dr. Hal P. Wells, Chicago: I feel that the contribution of Dr. Engelbach of St. Louis is of single importance on a subject which, as far as Roentgenologists are concerned, is

almost unknown. There are many things observed during a fluoroscopic examination in gastroenterologic cases which are recorded merely as roentgen findings and to which we are not able to assign diagnostic significance. This occurrence, however, which has been brought out by Dr. Engelbach, constituting duodeno-dilatation, I feel quite safe in saying would not even be observed as a Roentgen finding by most Roentgenologists who do gastroenterologic work. And particularly am I quite sure that those who might observe it could not be able to attach to it diagnostic significance.

At this stage of my work as Roentgenologist, it is important that we be given all the assistance possible from the internist in the interpretation of findings which we make at the fluoroscope and when internists like Dr. Engelbach, who are able to associate with the appearances on the fluoroscope their clinical and laboratory knowledge and by that conjunction place in our hands more intelligent interpretation, such internists are entitled to our gratitude.

The association which the Doctor calls attention to, between dilatation of the duodenum and gastroenteroptosis with corresponding or associated subjective symptoms, indicates to me that in cases which we have all examined, in which we have found chronic evidences with more or less pain or discomfort of the character described by Dr. Engelbach, we might have also been able to discover the duodenal condition had our attention been called to such an entity. And in the future, I am satisfied that by carrying this point in mind, we will in certain cases be able to give the internist a more intelligent interpretation and explanation of subjective symptoms in the cases which they send us, than we have been heretofore able to do.

At this stage of our development as Roentgenologists, particularly in this field, we are highly grateful for such assistance as Dr. Engelbach has given us, and on behalf of the Society, I thank him for his efforts.

Dr. B. H. Orndoff, Chicago: I think it is seldom we have before a Roentgenological Society the combination we had in this paper, combining the work of the internist so carefully with that of the Roentgenologist.

Among the things to which my attention was especially directed during the paper was that splendid method for filling the duodenum in the erect posture. I might add, however, that in the horizontal position before the upright fluoroscent screen, we can frequently observe a well filled duodenum while the patient is lying on the right side. In a few instances, I have noted quite extreme distention of the duodenum in this position, which remains for a longer or lesser period when the patient was brought to an erect posture. Another point which I have observed in this condition is that in certain cases the stomach will show very little tendency to empty barium through the pylorus in the erect posture. If barium be forced through by deep palpation, it will be found to pass through the duodenal cap into the circular portion of the duodenum. The greater mass of barium will collect in the most dependent part. Close observation will show that duodenal peristalsis will move the mass toward the jejunum, finding some evidence of obstruction at the last portion of the duodenum, the barium will drop back towards the duodenal cap. This oscillation will often be observed to continue for many minutes. Sometimes more than an hour before any barium will be observed to pass into the jejunum.

In these cases, I have also noted a segment of colon just distal to the hepatic flexure in the transverse colon to be extremely susceptible to spastic contraction. This spastic area is noted when the colon is filled from the barium of a meal as well as an opaque enema. The position of the stomach recalls to my mind a condition which was reported to me in this city. A surgeon working with a technician showed in some three cases that in the upright posture, the lower border of the stomach was very low. He proceeded

to operate upon these cases and with gastroplication demonstrated the stomachs in these cases to occupy a more proximal position. I understand also that he reported this work before a branch of the Chicago Medical Society, at which time his work was probably criticised. One sees so many very low stomachs in the erect posture that at times we are led to question what really constitutes gastroptosis. I sometimes wonder if it makes any difference where a stomach is located, if it empties itself properly.

I wish to express a great debt of gratitude to the essayist for this most complete paper and I personally wish to thank him for presenting it at this meeting.

Dr. O. H. McCandless, Kansas City: This is a paper I would come a good ways to hear. I am tremendously interested.

In the question of etiology, I am inclined to agree with Turck from the fact that we do have large feet and large ears, and we frequently encounter large duodena. I would like to have had the discussion opened by one of the internists because there is a symptom complex which is almost duplicated in several other conditions. Some of these cases with the symptom complex given here are sent back to the surgeon to look for fibroids, and in one week three patients were presented and two were operated on for fibroids because we had negative gastro-intestinal findings. In the first place, the normal pylorus objects to being milked. The duodenum that has to be compressed much to be visualized is a duodenum that usually evacuates. The meal is passing through that duodenum without obstruction and usually without ulcer findings. The reason I make the statement about the enlarged duodenum being not necessarily the result of obstruction is that we found one nonobstructive in a child two and a half years old last week. It is surprising how many abnormalities can be found in the very young that are not due to faulty function for any length of time. We have them in babies a few weeks old.

I have one patient who has a duodenal cap one-third the size of the stomach—just as we find big hands and big feet. There is danger that the Roentgenologist will make the diagnosis of dilated duodenum in the absence of the other symptoms required to make the diagnosis definite. In conjunction with the internist and surgeon this becomes one of the most valuable contributions we have. Turning this loose among the bunch who have not had a lot of experience will do more harm than it will good. The condition is not found very often and the fear is that we are going to find it all the time instead of in the isolated cases in which the dilatation is the actual factor producing the clinical symptoms the Doctor so well described.

Dr. William Engelbach, St. Louis, Mo. (closing): I wish to thank all the gentlemen for their discussion.

Dr. Trostler mentioned the liability to burns. Of course this is present, yet I have been trying to do X-ray work for 15 years without special protection except gloves, apron and the ordinary apparatus, and thus far, am free from burns. As to the point referring to different positions of the patient, enabling a better view of duodenum, that is part of the technique for X-ray men, who are doing gastro-intestinal work especially, to work out. In the examination of our six cases, who have obtained good operative results, the duodenum has been pretty far to the right, and that position is probably easiest to demonstrate with the patient standing before the fluoroscopic screen.

Dr. Wells referred to two subjects worthy of emphasis. One, the relation of dilated duodenum to symptoms of so-called enteroptosis, and two, the intermittency of these symptoms. If this syndrome is finally accepted, it will help to explain both of these points. The one reason why I brought it before this Society was to get the X-ray men to aid in assisting and working it out and determining its relation to interoptosis. I have never taken much stock in the abnormal positions or locations of organs as a direct cause

for abdominal symptoms. The so-called bands, kinks, veils, etc., have never been very convincing lesions to me, because we have never been able to get much relief by the surgical removal of these conditions. The results obtained from surgical operation on the cases of dilated duodenum, however, where there is intermittent partial obstruction, have been most decided. Albert's work, referred to in the original article, substantiated that this compression of the duodenum, by the mesenteric artery and root of the mesentery, was actually present in the enteroptotic type of abdomen, by placing his finger through the jejunal junction, anterior to the body of the vertebra, he proved that there was actual compression of this portion of the intestine.

There are many patients who have these intermittent symptoms and again other patients who have, apparently, the same enteroptotic organs without any symptoms. A number of years ago we fluoroscoped a large number of individuals, patients, nurses, internes, etc., having enteroptotic type of abdomen and a certain small percentage had symptoms but a large majority, with greatly displaced and variously enlarged organs, had none. We feel as if a proper understanding of a dilated duodenum will help to explain why some of these patients have and others do not have abdominal symptoms. The symptoms in dilated duodenum are very much more severe than those ordinarily found in enteroptosis. The extreme prolonged vomiting and acidosis has been present in the history of nearly all the cases which have been controlled by necropsy.

Dr. McCandless' discussion was much to the point, yet the size of the duodenum in itself is of importance, bearing the same relative importance as the size of the stomach bears to the size of the abdomen. I am convinced if one were to make a routine examination of the duodenum, as described in the technique given in this paper, normal duodenums *could not be dilated.* We have used this same technique for years, as a means to quickly fill the cap, during

the fluoroscopic examination and we find that in nearly every case, we can get the cap to fill within a few minutes, unless the patient is very large with thick abdominal walls. It is only occasionally that we can enlarge the second and third portions of the duodenum unless there is a dilated duodenum. There is no difference in the size of the connivente fold margins and the differentiation from the first and second portions of the duodenum, after using this procedure. When this difference does occur and a large sausage shaped shadow, even in density, without differentiation between the cap and the second and third portions of the duodenum and free from the serrated fold margins ordinarily present in the second and third portions of the duodenum, we feel pretty sure that we are dealing with a dilated duodenum. Other obstructions, besides the pressure from the arterio-mesentery, can, of course, cause this condition;—ulcers, jejunum and other lesions, outside of the intestines, at the jujuno-duodenal junction, might produce the same picture. We know, however, how exceedingly rare these are. In our few cases, and the ones reported roentgenologically, by Vanderhoff, Jordon and others, the X-ray findings are very much alike. If we could produce this roentgen picture of a dilated duodenum very frequently in our routine examination, we would be very skeptical about accepting it. It would be as questionable, for instance, as the incompetency of ileo-cecal valve, which is present in so many routine examinations, consequently would be of very little diagnostic value. Another point we must remember is that these cases are not constantly or completely obstructed but only intermittently and incompletely compressed. The second case reported was that of a dilated duodenum with attacks coming on suddenly, persistent vomiting for twelve hours, then free intervals of months during which the patient would be almost entirely free from symptoms. The long interval of freedom from symptoms is present in a majority of the history of these

cases, the constriction is relieved, patient frequently gains weight and the probabilities are that the deposition of inter-abdominal fat relieves the drag upon the mesentery.

With regard to the frequency of the condition, there is a question but what these cases occur more frequently than we suspect. Men who have once recognized the condition, either at autopsy or post-mortem, have reported a series of five or six cases in the succeeding year or two. It is just the case which has gone through repeated complete, careful examination, without sufficient objective findings to warrant a diagnosis, which frequently turns out to be dilated duodena of this type. In these cases, ulcer of stomach, duodenum, gall bladder disease, appendicitis, all causes for reflex vomiting in abdomen, spinal cord, pelvis, etc., have been carefully excluded, yet the patient continues to have attacks of extreme vomiting and other gastric disturbances. Many of them have been operated upon for gall bladder, appendicitis, Jackson's membrane, veils and kinks, without relief.

The objective X-ray findings of a dilated duodenum, of course, is not sufficient alone upon which to make a diagnosis. It is necessary to exclude absolutely all other causes for gastric disturbances of both motility and secretions, diseases of the cord, central nervous system, pelvic diseases, gall bladder, appendicitis, kidney lesions, etc., must be excluded.

I was much interested to hear the report of the resection of the duodenum in a previously gastro-enterostemized patient. I would suspect that this was a case of vicious circle, which was relieved entirely by the removal of the proximal loop of the duodenum. The only point I wish to emphasize in conclusion is that in the future if a routine examination is made for dilated duodenum, particularly in those cases in which the diagnosis of gastric and duodenal ulcer, gall bladder disease, appendicitis, renal and other reflex causes of vomiting can be excluded, I believe more of

these cases will be diagnosed and properly treated. The Roentgenologist can do a great deal to help prove or disprove the worth of this syndrome. Better correlation of the Roentgenological and Clinical findings with those found at operation and autopsy will be of great help in determining the actual worth and relation of dilated duodenum to clinical syndrome above described.

PRACTICAL SUGGESTIONS CONCERNING VARIOUS METHODS OF FOREIGN BODY LOCALIZATION

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My subject is, Practical Suggestions Concerning Various Methods of Locating Foreign Substances in the Human Body; a modest sort of undertaking in view of the fact that there are now upwards of two hundred more or less distinct methods based on a few rather simple principles but differing very widely in the detail of their technique and in the particular way in which they essay to apply the involved principles.

As I contemplated this crowded field in the light of the experience that many of us have had who have tried to invoke the mysteries of half a dozen or more of these many methods, I recalled the story of the little play of ''Seven Chances'' recently shown here in which the head line character finding it imperative under paternal mandate that he wed some sort of woman within an allotted time found that he had amongst his set seven more or less promising chances for his matrimonial requirements, seven girls of whom any

one would suit and serve his purpose if he could but hit upon a decent and proper manner of approach in putting the question.

His successive tryouts with first one and then another of these brilliant chances fairly scintillated with the brilliancy of his failure and defeat, and the depth of his chagrin was always in due proportion to the effort invested in laying and executing the plans for his conquest.

Until finally as the midnight hour of the last day of his allotted time drew near and he saw his large fortune that was at stake preparing to find lodgment elsewhere, because of the non-fulfillment of the prescribed conditions, he bethought himself of his childhood's first love, a very simple but withal a comely girl, who had stood by him in all his boyish awkwardness in childhood days when both their lives were simpler and less distracted. The denoument of the story is of course anticipated and entirely conventional, he makes a jig time courtship and amid the cheers of his many interested friends with a hop, step and jump he passes under the wire just in time to save his fortune.

Even so is it with this subject of localization as we contemplate it at the present moment, only instead of seven we have several score and seven chances from which to make our choice. As to the appropriateness of the comparison in this simile I will say that I hardly expect it to make much of a hit excepting with those of you who have brilliantly failed with some of the methods tried in this field. Of course when we speak of failure we understand what is meant, that is, that the surgeon fails when he goes after the foreign body.

I will confide to you also that it is with some feeling of satisfaction and pleasure that I note a tendency on the part of some of the path finders in Roentgenology to come back to our first love plain and simple as it is in availing themselves of the direct method of orthofluoroscopy in two planes of the foreign body, using the simplest of additional

apparatus that can be gotten by with consistently with accuracy of results at the operating table.

At the outset of this war I was asked by one of the then forming units that has since gone to the front, to present this same subject for the benefit of the surgeons who expected to be called upon to do this sort of work. I well knew at that time that I was expected to appear before them with an imposing array of apparatus to demonstrate and comparatively comment upon at least a few dozen of the then known methods. In order to more emphatically impress the point I wish to say my equipment on that occasion consisted of a piece of crayon, a blackboard, and plenty of time to thoroughly acquaint them with a few simple principles upon which all the methods were based, and these principles are comprehended in their practical entirety in the ordinary mathematic exercise of triangulation on the one hand, and orthofluoroscopy or orthoradiography in two planes on the other, using in the latter the thin pencil of X-light passed through a close diaphragm to locate the foreign body, and then indicators on the skin surface to mark for the surgeon the ascertained location in at least two planes at right angles one to the other. Of course, such elemental demonstration must also include some selected appliance for the application of the principle of triangulation, or at least some instrument or other simple equipment that will enable the operator to avail himself of the results of triangulation without resorting either to the reconstruction of the planes of the X-light as they were used in making exposures or sightings with the screen.

This latter requirement was first, I believe, accomplished by Mr. Hampson of England in his scale of coördinates which is described in Knox's work, and it has since found expression in a number of other forms, one of the latest of which was recently called to my attention by my esteemed friend Dr. Trostler of this city. This latter I will show you in a moment.

My belief at the time of my address above referred to at the beginning of the war was that Roentgenologists, guided by the demands of the surgeon who is of course the goat when failures are recorded, would soon begin to resolve complexity into simplicity and get back to a few methods, a very few, that everybody can understand and every surgeon follow to the point of getting his foreign body.

I will give you a very brief analysis of the whole subject and one that you can visualize for yourself even without the use of a graphic diagram, for I have prepared neither slides nor illustrations for this paper.

There are three prime headings under which every method must come.

1st. Orthofluoroscopy, or diagraphy, in two planes, either removing the foreign body under direct vision, the X-ray table and operating table being one; or under direct vision placing guides or a guide down to the body by means of which the surgeon follows its lead to the location of the body; or again by the use of merely surface indicators to mark the emergence of imaginary lines at the intersection of which the body is known to lie.

2nd. Stereoscopy, which is, as the only practical form of it with which I have had any experience or know anything about, a two plate method. This method may be with or without surface indicators.

And 3rd. Triangulation.

Under one or the other, or under a combination of them all methods will be found, and no method can in the last analysis, really be any more complicated than are these principles involved. But my point is that that is complication enough and then some as seen in one of the apparatuses I will place up here for your inspection. Number one, or orthodioscopy, is again divisible as has been already suggested into a number of methods many of which are more or less simple, easy of comprehension, easy of execution, and accurate in result.

Of these I will mention with especial emphasis the method of Sutton, and the very meagre appliances which I will show you in a moment and will leave here on the table for your inspection at your leisure. This method has been and is actually working out in service abroad as all of us know and seems to leave little to be desired in extremity work particularly, and I see no reason why it can not apply with equal practicability to cranial and chest and other regional work in any part of the body. I have been using it for about fifteen years myself off and on but without having the admirable equipment devised by Dr. Sutton with which to introduce the guides. I am claiming no priority over Dr. Sutton as no such stunt was ever published by me or reported in any way. I am merely endorsing it on the basis of some experience with the method.

Some of the Roentgenologists and surgeons operating in the war zone prefer the use of direct vision under ortho rays without resorting to wire guides. This is, of course, entirely practical, as is obvious, but the choice would probably depend more on facilities and appointments of the place in which one has to work, than merely upon a matter of election of one method against the other. But given conditions under which it is practical to operate under direct vision, where X-ray table and operating table may be made one, having facilities for the proper handling of lights, or a proper head hood carrying fluorescent screen and dark glass to be worn by the Roentgenologist assistant at the table, I believe most operators would elect to use this method of removal, as it is the most expeditious, and that's what counts.

Another very neat apparatus that has recently come to my attention through the kindness of Mr. Wallerich of V. Mueller & Co. is that of Scherer in which tube displacement is combined with direct sighting and in this way there is accomplished the ascertainment of the depth factor without the use of the direct introduction of guide wires, or without

any mathematical calculations or exposure of plates. I will not attempt to describe this apparatus for I can show it to you and say all that is necessary about it in a few moments.

As to Stereoscopy, we all know it has its advocates and chief exponents, particularly my good friend Dr. Emil Beck, who has attained to such skill in stereoscopic interpretation that as far as he is concerned I would feel like backing it pretty strongly as against any other method. But that is just the trouble with this method, the personal equation enters into it too much and on this score it is to my mind entirely disqualified as a ready and universal method. To say nothing of the technical difficulties connected with the proper making of a set of stereo plates. The mere fact of plates being a prerequisite is quite enough to disqualify it.

Next I come to the cause of most of the complexity and confusion of mind in this work, viz.: the principle of triangulation. As representing this mathematic proposition I will show what I believe is the latest instrument devised for the application of this principle and can recommend it highly both for reasonable facility of execution and procedure, and for the accuracy of results obtained. It would be entirely aside from the point for me to take your time in describing this appliance and particular method, as this can be gotten at your leisure from the printed pamphlet supplied by V. Mueller and Company and enclosed in the box containing each instrument. I have reference to the Fuerstenau Caliper, one of which I have here on the table for your inspection.

Under this heading comes the original method of Mackenzie-Davidson, the father of them all, and in passing I wish to sound a note of regret that this real pathfinder was so unfortunate as to burden his invention with an apparatus that was so cumbersome and impractical, even in its more modern forms, as to make its use almost prohibitive to the average worker, and it has hence been left to others following in his steps to achieve fame by the application of the

same principle involved and with far less initiative of thought than was shown by the inventor of the scientifically admirable machine which is still known as the Mackenzie Davidson Localizer. Its modern descendant is here shown more in an archeological sense than as a practical exhibit.

In contemplating this paper I feared that any attempt to describe in detail the representatives of the many methods in vogue or that have become enough talked about to be of interest to you would soon outreach a decent time limit, and I was therefore constrained to choose between an epitomizing analysis of the whole field in a manner calculated to give you some sort of grasp of the rationale of basic principles, or to buckle down to a sort of class room demonstration of and instruction in the technical details of some one or two methods which in my opinion might be most desirable.

I chose the former manner of treating the subject, feeling that it might be less tiresome and at the same time such a perspective view of the whole situation without any particular details of technique as might assist those of you who have not worked the matter out for yourselves in choosing along what route you prefer to travel in becoming proficient in some one or two methods of localizing foreign bodies with a view to their surgical removal.

It is hardly fair to close a paper of this sort without paying just tribute to the many good workers who have contributed their bit to ironing out the situation, but they are the names that are already well known to us, most of them, and they would gain no additional luster by my mention of them.

Before closing my paper I wish to make one exception to anything I may have said that might be construed as a criticism of complicated apparatus in the field of localization. This refers to the localization of foreign bodies deeply imbedded in the eye ball, and for it I use by preference an outfit that for complication of mechanism and formidable ap-

pearance has the Mackenzie Davidson driven into the back of the pasture.

But in this work we have practically fixed and constant conditions, obtaining alike in practically every case, dealing with an organ in the eye ball that irrespective of different sized individuals is of practically uniform size and dimensions so that one diagram or set of diagrams will suffice for all cases, so that it can be readily seen quite different conditions obtain as respects a method of foreign body localization than in any other part of the human anatomy. I refer to the Snook modification of the Mackenzie Davidson-Sweet Localizer. This machine weighs about seventy-five pounds and is about the size of a small trunk or I should have been glad to let it accompany the other members of the family that I will leave here for your inspection.

DISCUSSION

Dr. I. S. Trostler: I am guilty of owning that old Mackenzie Davidson apparatus and used to use it because at the time it was produced it was the best thing we had. I have found some bullets, pieces of glass, pieces of emery wheels and two or three pieces of the flywheels of engines with its help but nowadays I don't believe I would care to use it. I am in the habit of advocating the use of the stereoscopic method and with the aid of the surgeon who is not afraid of using his mind can usually localize any foreign body.

I do not believe Dr. Wells mentioned the Nelthorpe scale, which is a triangulation method which has a table giving definite tube distance and definite tube shift by which one can measure the distance of the shadow shift on the plate and secure the depth of the foreign body. It is a plate method which is all right in the hospital or laboratory, but I don't know where the men in the field are going to use it. I have used this scale—modified to suit my purposes—on needles when fairly deep in the foot, in one case of foreign

body in the head and a bullet in the tibia below the knee joint, and it has worked out very satisfactorily, but if I wanted to decide what to have used on me if I had a foreign body in my own anatomy I would not use a piece of machinery—I would go to Dr. Wells.

Dr. Hal P. Wells, Chicago (closing): In answering Dr. Trostler I wish to say that I mentioned the several methods only generally, purposely not going into details, although I intended to mention particularly the Nelthorpe scale, but neglected it.

Of course I appreciate the compliment Dr. Trostler has just passed me, and possibly will even admit that I am entitled to it. Now just a word as to why we are not all expert localizers. Which of us, unless he has been at the front, can boast of much experience in locating foreign bodies? I am a surgeon and am in charge of an organization covering several states and having several hundred thousand employes under its care, and I ought in that service to have some experience in foreign body cases. I don't get one in thirty days from the entire field. I believe with the exception of Dr. Sweet I get more foreign bodies in the eye than any man in the United States and of these my average would not exceed one a week. We don't get the work that will enable us to become experts. Taking the general run of industrial accidents—there are not many requiring localization, excepting simple observation by the use of the fluoroscope. This seems to me to be a practical explanation of why localization lags behind most other lines of work in Roentgenology as to the development of a generally accepted method and why it has been left by the Roentgenologists until the last hour to try to get something practical for war work. We have not had the incentive and necessity for doing it sooner.

ROENTGEN AID IN GASTRO-INTESTINAL PRACTICE

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The Roentgenologist hesitates to say of what service he can be to the internist or surgeon. Those of us who regularly work as a consultant do not wish to appear as an *"I Can."* The trained Roentgenologist does not himself know his limitations. The improvements of tomorrow may make our work of today seem trivial.

When I say Roentgenologist, I do not have in mind a doctor who owns a Roentgen laboratory and who can make good Roentgen plates. I am thinking of the doctor who has by learning and training the ability to separate the normal from the abnormal. He must have been a diagnostician,—a clinician,—before being a Roentgenologist.

Roentgenology has to do largely with shadow defects. Therefore, to know the normal is absolutely essential.

Aside from any special fitness necessary in the observer, a willingness for hard work is essential in the roentgenologist in gastro-intestinal work.

The object of this paper is to show how the roentgenologist can be of service in the diagnosis of gastro-intestinal complications.

Because my time is limited I will pass the mode of giving the barium meal.

Practically speaking, the alimentary tract is invisible until filled with some salt opaque to the Roentgen rays. Inflation can be used but is not satisfactory. Stomach and bowels must be empty before an opaque meal is given; if not,

the translucent food will displace the opaque salt and apparently cause a filling defect.

During the taking of the meal we watch the patient's mode of swallowing. Look for hindrances or saculations in the oesophagus. Is there more than a normal slowing at the cardia?

We notice how the stomach fills, its outlines, its irregularities, the character of the waves. We watch the bulb fill. If we do not see the bulb we are turning the patient in a different position. If still not seen we are using manipulation until the bulb is seen. We are stopping the flow, if necessary, in the duodenum for observation. If irregularities are noted, palpation is made to note painful points. A plate, if wanted, is now made.

At this time I wish to say that I take no stand for or against the so-called direct or indirect method of gastro-intestinal examination. To me the screen and plate are not rivals. They are complements. I want to feel painful points and I want plates as records for filling defects. I can in a medium weight patient see things well on the screen. I can in a heavier patient see shadows better on the plate.

I will not attempt to give you the symptoms of gastric lesions. I wish to say that you might find no symptoms which the case justifies, and find symptoms not expected. For instance, I will show cases in which there was gastric retention for more than five days, but no vomiting. I will show you colon obstructions with no constipation. In carcinoma of the stomach we have some patients eating everything they wish and denying pain, except to deep palpation. Other patients can take little or no food at all, and are in constant pain. A peculiar thing to me is a patient, with partial retention for days, taking three meals daily. I try to forget the classic symptoms and study each case as an individual.

Ulcer is not always discernible from carcinoma. Ad-

vanced carcinoma can, of course, be recognized. What the pathologist must search for with the microscope, the roentgenologist cannot see in the living subject. Every surgeon of wide experience has operated for carcinoma and found ulcer. Every roentgenologist of wide experience has diagnosed ulcer when carcinoma was present.

Ulcer of the stomach may be in size from a pin head or mere mucous slit to the size of a one-half dollar, and is usually situated on the lesser curvature or posterior stomach wall. Ulcer crater may or may not be present. Hour-glass stomach may or may not be present. If the hour-glass stomach is present and is due to causes other than stomach ulcer, the hour-glass contraction will disappear with change of position or hypodermic of atropine. Persistent hour-glass stomach is practically pathognomonic of ulcer, and is caused by an irritation of the circular muscle fibres in the ulcer plane. The sulcus is usually eccentric, and near the lesser curvature. In new growths the sulcus is generally central. Adhesions may form a sulcus of any shape.

During the past year I have noticed in two patients a condition that I have not seen described. Both patients suffering from gastric ulcer when given a barium mixture. After swallowing a glassful of the mixture the stomach immediately showed an hour-glass form. But after filling the stomachs the sulcus disappeared to again reappear when the stomachs were partially emptied. These examinations were repeated on different days and the condition was constant.

I take it that the stretching of the muscle fibres by the stomach fullness or the weight of the full barium meal temporarily overcame the muscle spasm. Both patients were operated on and the ulcer diagnosis verified.

Ulcer of the duodenum when seen shows us a filling defect. A constant filling defect means a pathological condition. It may mean a duodenal ulcer. It may be caused by

extraneous causes, such as gall bladder adhesion or pressure from other organs.

Ninety-five per cent of duodenal ulcers occur in the first position.[1] If during an examination the bulb is once seen full in a normal condition we can safely exclude ulcer of this part of the duodenum.

The bulb does not always fill quickly. It may take from minutes to an hour. By palpation, change of position or deep breathing the bulb can usually be filled.

In gastric cancer the Roentgen Ray is a most important means of diagnosis. In early gastric cancer clinical methods alone are hopeless. The Roentgen Ray here will enable us to diagnose the cancer while it is amenable to surgical treatment.

The examination of the gall bladder is still to be improved on. I know that some of our eastern friends are claiming an 85 to 95 per cent in gall bladder diagnosis. That is too high for me. Given a favorable subject and an exceptionally good plate the *normal* gall bladder will usually show. In the average patient to show the gall bladder, the gall bladder must be abnormal. To show gall stones is fairly easy. But more gall bladders without stones need operation than gall bladders with stones. While speaking of gall bladder be careful not to see gall stones when you are looking at fecal matter in the colon.

The small intestines give us but little trouble. The feathery jejunum can always be seen and the ileum as a dense rounded regular mass. The intestines can be displaced by the kidney, spleen, liver, etc. Hernial sacks are of surgical interest.

The appendix is interesting to the Roentgenologist. We find the appendix up as far as the gall bladder and also see the cecum dipping down into the true pelvis. The appendix

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[1] Since writing the above I have seen one case operated on in which there was no bulb deformity, but duodenal ulcer was present.

can be found reaching over to the left lower quadrant. Because an appendix fills we do not class it as diseased. The interesting point is does the appendix drain quickly. A poorly drained appendix possesses a danger in proportion to the length of time it takes to empty itself.

Going along the ascending colon we are watching for filling defects and adhesions. At the hepatic flexure we are particularly careful to note painful points in relation to position, especially in relation to the gall bladder and the bulb. I will illustrate this point a little later.

Examining the transverse colon we note its position. Is it movable or bound down by adhesions. The transverse colon may occupy any position from the costal margins to being a pelvic organ.

While speaking of the transverse colon I desire to mention the following case. This case illustrates the fact that no diagnosis of any part of the gastro-intestinal tract should be made until a complete study of the digestive system has been made.

Miss K. was referred July, 1915, by Dr. Schmallhorst with the following history. Patient had been operated on for appendicitis about a year previous to this examination. The doctor states that the appendix was very long, extending to the hepatic flexure of the colon and adherent in its entire length. Much difficulty was experienced in its removal. The patient did fairly well for a short time only, when vomiting began.

Patient became much constipated and was suffering constant pain—as she expressed it—in the stomach. At the time of this examination Miss K. could take little or no food. Vomiting was persistent, pains constant and constipation obstinate. All trouble was referred to the stomach.

A test meal was given which progressed normally until it reached the terminal ileum where there was a thirty-hour delay. At forty-eight hours the ileum still showed a barium

deposit. The ileum was bound down low in the pelvis and was painful to deep palpation.

After passing the ileum the barium column came to a stop about the center of the transverse colon. Here the column rested twenty-six days notwithstanding the fact that after the tenth day three and four enemas were given to dislodge the mass. Of course some was passed daily, but the twenty-seventh day still shows a faint trace of barium in the transverse colon. On the twenty-ninth day a barium clysma was given and stereoscopic plates were made.

As seen in the stereoscopic view, the colon is constricted as if tied with a puckering string and its lumen seems about the size of a lead pencil. A diagnosis of post-operative adhesions was given. Four days later the diagnosis was verified when the patient was operated on at the Lutheran Hospital.

Adhesions of the colon before operation are often seen. They will be shown you. In fact every point mentioned in this paper is of personal experience and will be illustrated. For showing colon new growths, the enema is probably best. We may have obstruction in the colon to the clysma, but no obstruction to the barium meal. I have seen this but once.

Malpositions due to past operative adhesions or to tumors are seen.

The sigmoid is often redundant. I will show you one going to the hepatic flexure.

Diverticalities is seen fairly often.

During the past month a lady 53 years old was referred to me for an examination. She walked into my room and gave me the following history. Had always felt well and was now feeling about normal. She says her bowels had not moved for twelve days. Over the phone her doctor had told me that he had tried laxatives, cathartics and enemas for ten days without result. Because the patient felt fairly well and had enjoyed good health without loss of weight or discomfort, and because constipation had never been trou-

blesome carcinoma was not seriously thought of until the last few days. There had been some vomiting but not bothersome. Under fluoroscopic examination the entire colon could be seen as a dark mass. There was no gaseous distensions to be seen in the intestines. I ordered enemas of warm sweet oil which were used without result.

As an experiment I gave the patient a glass of barium mixture to drink. Her nurse was ordered to give enemas of oil and water and to have the patient retain them as long as possible. About 20 hours later I again examined the patient and found that the barium mixture had coated the entire colon contents as I will show you on the slide. By giving a clysma of barium I could go within an inch of the fecal column. I was then enabled to see the filling defect in the sigmoid about at the rectal junction. Two days later the patient was operated on and the diagnosis of carcinoma confirmed. I mention this case because I find no such case recorded. The surprise to me was that the barium should coat a twelve days' colon content in 20 hours.

The slides shown give you a small conception of the possibilities of the Roentgen Ray when properly used. Do not think that you must find a stomach or duodenal lesion because the patient has been referred for that purpose. W. J. Mayo says one person in ten who has gastric symptoms has a gastric lesion. Consider well the clinical evidence. Have an orderly routine. Your interpretation must be good. Reexamine your doubtful cases. Have the honesty to admit when your findings are inconclusive.

ROENTGENOGRAMS OF PULPLESS TEETH

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There has been a great deal of criticism recently in Dental Literature regarding the wholesale extraction of teeth by dentists who have had no special training in the interpretation of dental radiographs and also due to the hasty advice of physicians who hoped the patient would improve as a result of the extractions.

We are daily confronted with patients who present themselves for treatment, and our primary object with every one is to remove infection whether due to unfilled roots or pyorrhea. It is imperative that the patient have a well made set of radiographs of the entire mouth and if any area is doubtful another radiograph should be made at a different angle and it is often surprising to see how differently a condition will appear as the X-ray at best is but a shadowgraph and is never a clear photographic expression of the pathologic condition. Distortions due to varying density of structures and differences due to angles of focus are often responsible for wrong impressions and frequently the X-ray will permit infected areas to pass unnoticed. It is in these unrecognized foci of infection that real danger lies, especially if after the X-ray has shown no appreciable pathological change and the patient is assured that the X-ray shows nothing. When as a matter of fact there may be the foci of infection there that may be the cause of considerable systemic trouble. So it behooves the Roentgen operator to employ every precaution in obtaining radiographs possessing rich detail so that a definite scientific diagnosis may be made.

Too often the size of the area above a pulpless tooth is taken as an indication of the amount of harm that might result which is entirely wrong as the most virulent infections are usually found in the smaller areas. Again an area of increased transparency instead of meaning that it contains an active infection may contain a granuloma where the old abscessed condition has undergone the process of repair or may still contain infectious matter ready to spring into full activity upon the slightest irritation.

Dr. Schuhmann has recently stated that other sinus shadows over teeth are due to the fact that in the process of devitalizing and treating teeth many times drugs are employed which act as strong escharotics and the result may be a coagulation of lymphoid matter over the root end which will appear as a darkened shadow over the apex of the tooth. So exercising all the care and skill an individual can in the passing of judgment on dental radiographs he will still make a few mistakes but when in doubt always let the old slogan "safety first" be your guide and extract. I also feel that no one is justified in passing judgment on a set of radiographs without seeing the patient or at least having a full history of the case and more definite results will be obtained if radiographs are studied while examining the mouth, also having thorough knowledge of the patient's general systemic condition.

No matter how well a root may be treated and filled there is still an element of doubt as to whether or not there may be some hidden infection there and Dr. Rosenow makes the statement that every devitalized tooth has an area of lowered resistance about the root end and should be considered unsafe.

Beginning or inflammatory changes of bone infection is not discernible in the radiograph as it does not at once produce gross bony liquefaction. After several days or weeks there is sufficient decalcification for recognition: so when

an area is found over an apex it is hard to determine the length of time infection may have been present.

In the face of these facts in order to insure safety for our patients it is necessary to continue with extractions but instead of being condemned hastily as in the past we now feel inclined to weigh carefully the radiographic and clinical findings and take into consideration the personal equation and when we conscientiously exercise these precautions no unnecessary extractions will be done as the medical profession are now leaving these serious questions to the dentist who has an understanding of Roentgenographic pathology.

It is not my purpose in this short paper to attempt to discuss all that would come within the scope of this field but to limit myself to these three phases, namely:

1. Indications for the extraction of teeth. 2. Indications for treatment. 3. Indications for keeping under observation.

In the first classification I will mention a few conditions in which we find pulpless teeth that we can with impunity remove. All pulpless teeth which are not necessary for cosmetic reasons and of no use in mastication should be extracted. In this class will be mostly third molars around which will also be found pockets harboring bacteria due to the fact that there is usually not enough space to completely erupt and the tissue overlies the enamel surface but cannot attach. All teeth which show a definite area of infection on a patient who is beginning to show evidence of the absorption of toxins should be relieved of these infected areas as it is nothing short of criminal to allow them to remain and as a consequence have a heart lesion or an impaired joint.

All pulpless teeth over which there is a cyst, removal is usually necessary and also the entire cystic membrane to prevent too great a loss of bone due to the continuous pressure of the cyst wall on adjacent structure and often becoming secondarily infected, causing a great deal of trouble.

Teeth which have been treated and the walls of the canals perforated, the usual result being an alveolar abscess, should be removed.

In the process of treating teeth one often encounters a condition where it is impossible to gain access to the infected area through the root canal, due perhaps to the fact that a phalanx of cement has been forced into the canals which cannot be removed, also broken broaches are often met with high in the root which cannot be taken out, so the tooth should be extracted.

Any tooth where the pulp dies before the roots have attained their full growth, leaving a wide open root end, which invariably are seriously infected and should be taken out.

Impacted teeth under most conditions should be extracted but I will not go into this subject as it is too lengthy for consideration here.

Teeth infected from pyorrhea where the radiograph shows the bone structure gone to any extent should be taken out but this is a subject in itself and worthy of a paper on that alone.

Under the heading of teeth to be retreated I will mention just a few conditions where this can be safely done.

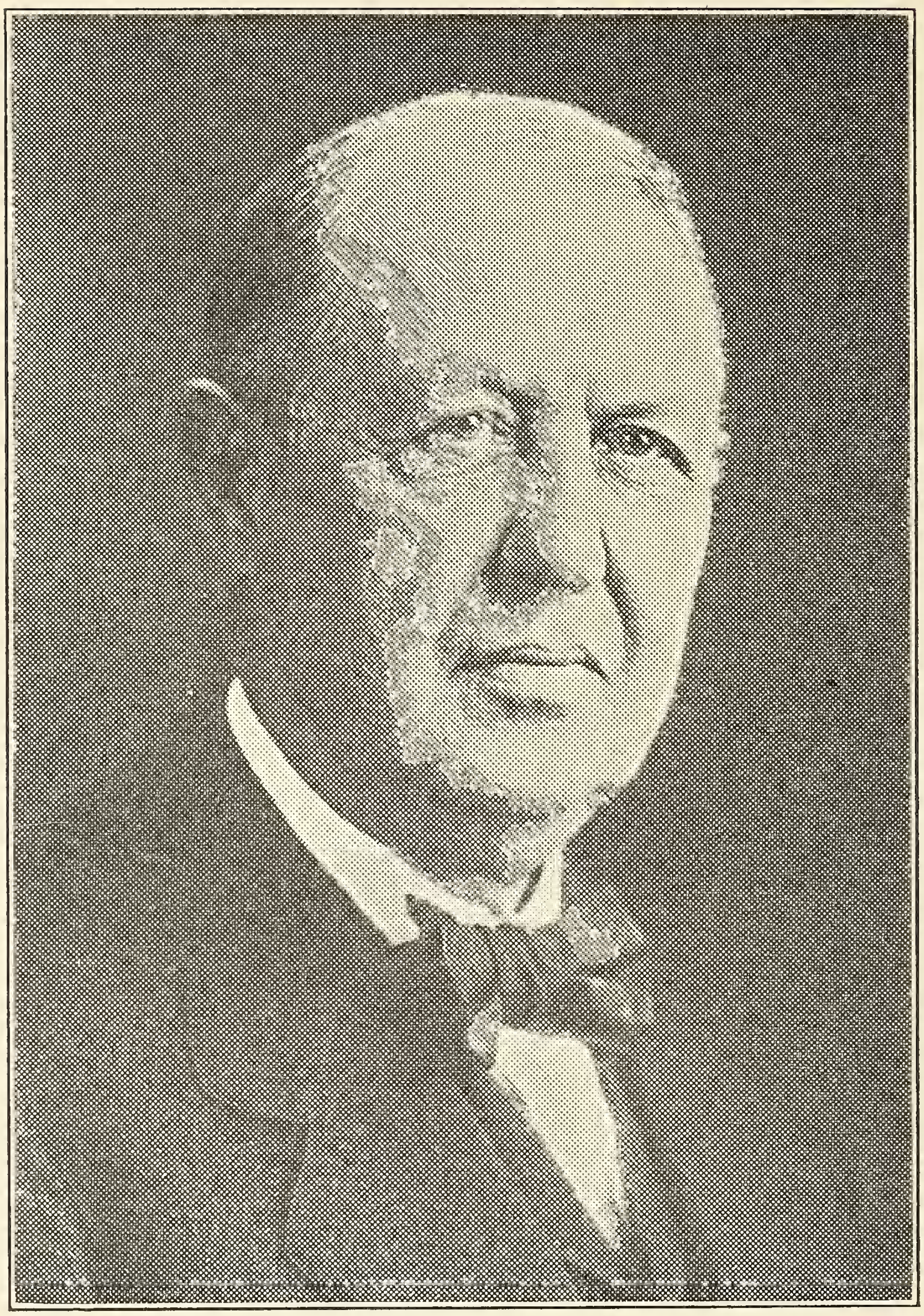
Dr. Moorehead says that less than ten per cent of dentists are able to do reliable root canal work due to lack of technique and proper training in so highly a specialized operation requiring a knowledge of medicine plus aseptic surroundings and a great perseverance, requirements which are possessed by only a few.

Teeth which have only an indefinite area about the root end where the canals can be opened may be treated and filled but the X-ray should be used to show the work properly done and another radiograph taken about a year later to see that no further trouble has developed. In patients who are in the best of health one may attempt treatment in teeth showing large areas but often in these conditions the

root ends are roughened and to insure freedom from reinfection a root resection should be performed which is usually successful if well done.

In the classification of pulpless teeth to be kept under observation I have many in mind where the root end is very small and the canals may not be properly filled and where there is no evidence of infection over the apex, and the tooth perfectly comfortable. If these teeth are opened and treated and the root end enlarged it is subject both to haemolytic infections, and infection introduced from without, and better left untouched. These teeth should however be radiographed a year or so later and if still in the same apparent safe condition will beyond doubt remain so indefinitely. In this class the upper bicuspids are the most frequent.

In the darkness and doubt of infections of pulpless teeth and the demand for "more light" we find our only solution in the prevention of these conditions is to avoid the initial introduction of caries in tooth structure and this can be done by strict prophylaxis. Dentistry in the past fifty years has made wonderful strides and the men responsible for this progress are worthy of highest praise. In the past however nearly every effort has been to repair lost tooth structure with but little thought being given to prevention. In the new era upon which we are entering, when prophylaxis will be practised and preached, we will have mouths where every tooth is highly polished instead of broken down and infected. At least 90 per cent of decay and 95 per cent or even more of the dead pulps will be prevented and the patient have teeth beautiful to look at, as well as representing the maximum in masticating efficiency, and comfort, with absolute freedom from pyorrhea and gingivitis. This Utopian period in dentistry is bound to come as it is the very essence of common sense, but will come much sooner with the earnest coöperation of the medical profession.



WILLIAM LEWIS BROSIUS, M. D.

ON THE DEATH OF DR. WILLIAM LEWIS BROSIUS

To those of us who have known him best comes the sorrow. To those of us who have known the inspiration of his personality and earnestness comes the loss.

His death came suddenly from a heart lesion while in his laboratory in Gallatin, Thursday afternoon, April 18th.

For the past fifteen years he has devoted all of the time consistent with his many other duties to the advancement of X-ray and cancer research.

Each year saw him active in the eastern meetings and at the time of his death he was compiling results gleaned from his work as a member of the Missouri State Cancer Commission for the Western Roentgen Society. He was one of the pioneers in referring cancer of the breast for post-operative Roentgen treatment and soon after installed equipment for its use in his office, keeping abreast or in advance of the western leaders in the work.

Modest, kindly, eagerly seeking that he might bestow on us his fellow-workers some of the wealth from his store of research.

He has been especially active in the state organization as an official, committeeman and member and was, at the time of his death, State Counsellor for the Western Roentgen Society. He was known to every prominent X-ray worker in the east and to us in the west his loss will be more keenly felt as the days go by.

Dr. Brosius was born April 7, 1853, in Gallatin, Missouri, and was graduated from the Philadelphia School of Medicine in 1881. He is survived by a wife and two children, Mrs. H. J. Eldridge of Pulaski, Tenn., and Dr. William L. Brosius, Jr., formerly with Dr. Joneway in Johns Hopkins, Baltimore, recently commissioned in the Reserve Corps.

To his family we extend our sympathy and with them share the sorrow of our fellow and friend whom we loved.

O. H. McCandless.

RESPONDING TO THE COUNTRY'S CALL

Alguire, Captain Alden. Camp Greenleaf, Chickamauga Park, Ga.

Burcham, Major T. A. Somewhere in France.

Donaldson, Lieut. Clyde.

Donavan, Lieut. J. J.

Gilmore, Captain W. H. Fort Oglethorpe.

Hecker, Captain William.

Lier, Lieutenant C. N. O. Somewhere in France.

Lowry, Lieutenant N. H. Boston—to receive instruction in Orthopedic Surgery.

Lucas, Chas. G.

McConnell, Major M. R. C. Guthrie. Department Laboratory, Fort Leavenworth, Kan.

Merritt, Major E. A. Base Hospital, Camp Lee, Va.

Meyer, Lieut. V. J.

O'Hara, Captain Fred F. Camp Taylor, Ky.

Wohl, E. W.

The above list of members of the Western Roentgen Society in various branches of the Army and Navy include all that we have been able to locate to date. A few of the addresses given are doubtless incorrect, and we would appreciate any additions, corrections, or changes of addresses with which you may be able to supply us.

KEY TO HONOR ROLL

NATIONAL ARMY CANTONMENTS

Camp Devens..........Ayer, Mass.
Camp Upton..Yaphank, L. I., N. Y.
Camp Dix......Wrightstown, N. J.
Camp Meade...Annapolis Jct., Md.
Camp Lee.........Petersburg, Va.
Camp Jackson......Columbia, S. C.
Camp Gordon........Chamblee, Ga.
Camp Sherman....Chillicothe, Ohio
Camp Zachary Taylor Louisville, Ky.
Camp Custer...Battle Creek, Mich.
Camp Grant..........Rockford, Ill.
Camp Pike.......Little Rock, Ark.
Camp Dodge.....Des Moines, Iowa
Camp Funston....Fort Riley, Kan.
Camp Travis Ft. Sam Houston, Tex.
Camp Lewis American Lake, Wash.

NATIONAL GUARD CONCENTRATION CAMPS

Camp Bartlett.....Westfield, Mass.
Camp McGuiness Framingham, Mass.
Camp Wadsworth.....Calvert, S. C.
Camp Hancock........Wheless, Ga.
Camp McClellan.....Anniston, Ala.
Camp Sevier.......Greenville, S. C.
Camp Wheeler.........Macon, Ga.
Camp MacArthur.......Waco, Tex.
Camp Logan.........Houston, Tex.
Camp Cody.........Deming, N. M.
Camp Doniphan.....Fort Sill, Okla.
Camp Bowie......Fort Worth, Tex.
Camp Sheridan...Montgomery, Ala.
Camp Shelby....Hattiesburg, Miss.
Camp Beauregard..Alexandria, La.
Camp Kearney....Linda Vista, Cal.
Camp Green.......Charlotte, N. C.
Camp Mills....Mineola, L. I., N. Y.
Camp Fremont......Palo Alto, Cal.

INCREMENT CAMPS

Belvoir; Fort Benjamin Harrison; Chickamauga Park (Fort Oglethorpe); Douglas, Ariz.; Fort Dougles, El Paso; Fort Ethan Allen, Gettysburg, Pa.; Leon Springs; Camp McCoy; Camp Robinson; Fort Meyer; Fort Riley; Fort D. A. Russell; Fort Sam Houston; Presidio of San Francisco; Fort Sill; Fort Snelling; Syracuse, N. Y.; Vancouver Barracks; Camp Wilson.

RESERVE OFFICERS' TRAINING CAMPS

Allentown, Pa. (Medical)
Fort Benjamin Harrison
Fort Benjamin Harrison (Medical)
Fort Des Moines
Fort Des Moines (Medical)
Camp Jos. E. Johnston (Quartermaster)
Fort Leavenworth (Engineers)
Leon Springs (Texas)
Fort Logan H. Root
Madison Barracks
Fort McPherson
Fort Meyer
Fort Niagara
Fort Oglethorpe
Fort Oglethorpe (Medical)
Plattsburg Barracks
Fort Riley (Medical)
Fort Riley
Presidio of San Francisco
Fort Sheridan
Fort Snelling
Vancouver Barracks (Engineers)
Washington, D. C. (Engineers)

AERO TRAINING STATIONS

Memphis, Tenn. ....Park Field
Belleville, Ill. ....Scott Field
Dallas, Tex. ....Love Field
Essington, Pa. ....Chandler Field
Fairfield, Ohio Wilbur Wright Field
Fort Sill, Okla..........Post Field
Fort Worth, Tex. ..Taliaferro Field
Jarvis Field, Edwards Field
Hampton, Va. .....Langley's Field
Houston, Tex. ......Ellington Field
Lake Charles, La.....Gerstner Field
Mineola, L. I., N. Y. Hazelhurst Field
Mt. Clemens, Mich...Selfridge Field
Omaha, Neb. ....Fort Omaha (Army Balloon School)
Pensacola, Fla. (P. O., Warrington)
Rantoul, Ill. ....Chanute Field
San Antonio, Tex. .....Kelly Field
San Diego, Cal. ....Rockwell Field
Waco, Tex. ....Rich Field
Wichita Falls, Tex. .....Call Field

POSTS AND STATIONS OF THE ARMY

Adams, Fort.........Newport, R. I.
Ajo Garrison............Ajo, Ariz.
Allentown..........Allentown, Pa.
Andrews, Fort Fort Andrews, Mass. (Tel. & Exp., Boston)
Apache, Fort....Fort Apache, Ariz. (Tel. & Exp., Holbrook)
Armistead, Fort.....Baltimore, Md.
Army and Navy General Hospital Hot Springs, Ark.
Augusta Arsenal......Augusta, Ga.

Baker, Fort..........Sausalito, Cal.
Banks, Fort.....Winthrop Station, Boston, Mass.
Barrancas, Fort Fort Barrancas, Fla. (Exp., Pensacola)
Barry, Fort........Fort Barry, Cal. (Exp., Saulsalito)
Bayard, Fort (Genl. Hosp.) Fort Bayard, N. M.
Belvoir, Va............Belvoir, Va.
Benicia Arsenal.......Benicia, Cal.
Benjamin Harrison, Fort Indianapolis, Ind.
Bliss, Fort.........Fort Bliss, Tex. (Exp., El Paso)
Boise Barracks........Boise, Idaho
Brady, Fort Sault Ste. Marie, Mich.
Brownsville Garrison Brownsville, Tex.

Calexio Garrison Calexio, Cal.
Canby, Fort.........Ilwaco, Wash.
Carroll, Fort........Baltimore, Md.
Casey, Fort......Fort Casey, Wash. (Exp., Port Townsend)
Caswell, Fort......Southport, N. C.
Clark, Fort......Brackettville, Tex. (Exp., Spofford)
Columbia, Fort Fort Columbia, Wash.
Columbus Barracks Columbus Barracks, Ohio
Columbus Garrison Columbus, N. M.
Constitution, Fort Newcastle, N. H.
Corpus Christi Garrison Corpus Christi, Tex.
Crockett, Fort......Galveston, Tex.
Crook, Fort.......Fort Crook, Neb.

Dade, Fort.........Fort Dade, Fla.
D. A. Russell, Fort Fort D. A. Russell, Wyo.
Delaware, Fort..Delaware City, Del.
Del Rio Garrison......Del Rio, Tex.
Des Moines, Fort Fort Des Moines, Iowa
De Sota, Fort....Fort De Sota, Fla.
Disciplinary Barracks Alcatraz Island, Cal.
Disciplinary Barracks Fort Leavenworth, Tex.
Disciplinary Barracks Fort Jay, New York, N. Y.
Donna Garrison........Donna, Tex.
Douglas Garrison....Douglas, Ariz.
Du Pont, Fort..Delaware City, Del.
Eagle Pass Garrison Eagle Pass, Tex.

Edinburgh Garrison Edinburgh, Tex.
El Paso Garrison.....El Paso, Tex.
Ethan Allen, Fort Fort Ethan Allen, Vt.

Flagler, Fort...Fort Flagler, Wash.
Foster, Fort..........Kittery, Me.
Frankford Arsenal Bridesburg, Philadelphia, Pa.
Front Royal......Front Royal, Va.

Gaines, Fort...Dauphin Island, Ala.
George Wright, Fort Spokane, Wash.
Getty, Fort......Fort Greble, R. I.
Governor's Island Garrison Governor's Island, N. Y.
Greble, Fort......Fort Greble, R. I.

Hachita Garrison....Hachita, N. M.
Hamilton, Fort......Fort Hamilton Station, Brooklyn, N. Y.
Hancock, Fort..Fort Hancock, N. J.
Harlingen Garrison Harlingen, Tex.
Heath, Fort......Winthrop Station, Boston, Mass.
H. G. Wright, Fort Fisher's Island, N. Y.
Hidalgo Garrison.......Hidalgo, Tex.
Howard, Fort....Fort Howard, Md.
Huachuca, Fort Fort Huachuca, Ariz.
Hunt, Fort.........Fort Hunt, Va.

Jackson Barracks New Orleans, La.
Jay, Fort.........New York, N. Y.
Jefferson Barracks Jefferson Barracks, Mo.
J. E. Johnston, Camp State Camp, Fla.

Keogh, Fort......Miles City, Mont.
Key West Barracks Key West, Fla.
Kingsville Garrison Kingsville, Tex.

Laredo Garrison.......Laredo, Tex.
Lawton, Fort........Seattle, Wash.

Leavenworth, Fort
Fort Leavenworth, Kan.
Leon Springs....Leon Springs, Tex.
Levett, Fort.........Portland, Me.
Lincoln, Fort......Bismarck, N. D.
Llano Grande Garrison
Llano Grande, Tex.
Logan, Fort......Fort Logan, Colo.
Logan H. Root, Fort Argenta, Ark.
Lyon, Fort...........Portland, Me.

MacKenzie, Fort
Fort MacKenzie, Wyo.
Madison Barracks
Sackett Harbor, N. Y.
Mansfield, Fort....Watch Hill, R. I.
Marathon Garrison Marathon, Tex.
Marfa Garrison........Marfa, Tex.
Mason, Fort....San Francisco, Cal.
McAllen Garrison....McAllen, Tex.
McCoy, Camp.........Sparta, Wis.
McDowell, Fort...Angel Island, Cal.
McIntosh, Fort........Laredo, Tex.
McKinley, Fort......Portland, Me.
McPherson, Fort
Fort McPherson, Ga.
McRee, Fort...Fort Barrancas, Fla.
Meade, Fort.....Fort Meade, S. D.
Memphis Garrison..Memphis, Tenn.
Mercedes Garrison..Mercedes, Tex.
Michie, Fort (N. Y.)
New London, Conn.
Miley, Fort.....San Francisco, Cal.
Mineola Garrison....Mineola, N. Y.
Mission Garrison.....Mission, Tex.
Missoula, Fort.....Missoula, Mont.
Monroe, Fort.....Fort Monroe, Va.
Morgan, Fort....Fort Morgan, Ala.
Mott, Fort............Salem, N. J.
Moultrie, Fort...Moultrieville, S. C.
Meyer, Fort.......Fort Meyer, Va.

Naco Garrison..........Naco, Ariz.
New York Arsenal New York, N. Y.
Niagara, Fort...Youngstown. N. Y.
Nogales Garrison....Nogales, Ariz.

Oglethorpe, Fort........Dodge, Ga.
Omaha, Fort..........Omaha, Neb.
Ontario, Fort........Oswego, N. Y.

Palm City Garrison Palm City, Fla.
Penitas Garrison......Penitas, Tex.
Perry, Camp.....Camp Perry, Ohio
Pharr Garrison.........Pharr, Tex.
Philip Kearney, Fort
Fort Greble, R. I.
Picatinny Arsenal.....Dover, N. J.

Pickens, Fort..Fort Barrancas, Fla.
Plattsburg Barracks
Plattsburg, N. Y.
Porter, Fort..........Buffalo, N. Y.
Preble, Fort.........Portland, Me.
Presidio of Monterey Monterey, Cal.
Presidio of San Francisco
(Letterman Genl. Hosp.)
Presidio Station, San Francisco, Cal.
Progreso Garrison Relampago, Tex.

Reno, Fort
Fort Reno, Darlington, Okla.
Revere, Fort...........Hull, Mass.
Riley, Fort........Fort Riley, Kan.
Ringgold, Fort..Fort Ringgold, Tex.
Robinson, Fort Fort Robinson, Neb.
Rock Island Arsenal Rock Island, Ill.
Rodman, Fort..New Bedford, Mass.
Roma Garrison.........Roma, Tex.
Rosecrans, Fort.....San Diego, Cal.

St. Philip, Fort..Fort St. Philip, La.
Sam Houston, Fort
Fort Sam Houston, Tex.
San Antonio Arsenal
San Antonio, Tex.
San Benito Garrison San Benito, Tex.
San Diego Garrison San Diego, Cal
Sandy Hook Proving Ground
Fort Hancock, N. J.
San Jacinto, Fort...Galveston, Tex.
San Juan Garrison...San Juan, Tex.
Schuyler, Fort...Westchester, N. Y.
Screven, Fort.....Fort Screven, Ga.
Sheridan, Fort...Fort Sheridan, Ill.
Sill, Fort...........Fort Sill, Okla.
Slocum, Fort....Fort Slocum, N. Y.
Smallwood, Fort....Baltimore, Md.
Snelling, Fort..Fort Snelling, Minn.
Springfield Armory Springfield, Mass.
Standish, Fort...Portsmouth, N. H.
Stark, Fort......Fort Stevens, Ore.
Strong, Fort.........Boston, Mass.
Sumter, Fort....Moultrieville, S. C.

Taylor, Fort........Key West, Fla.
Terry, Fort.......Fort Terry, N. Y.
Texas City........Texas City, Tex.
Thomas, Fort.....Fort Thomas, Ky.
Totten, Fort.....Fort Totten, N. Y.
Travis, Fort........Galveston, Tex.

Vancouver Barracks
Vancouver, Wash.

Wadsworth, Fort...Rosebank, N. Y.

Walter Reed Genl. Hosp.
Takoma Park, Washington, D. C.
Ward, Fort......Fort Ward, Wash.
Warren, Fort........Boston, Mass.
Washington Barracks
Washington, D. C.
Washington, Fort
Fort Washington, Md.
Watertown Arsenal
Watertown, Mass.
Watervliet Arsenal Watervliet, N. Y.
Wayne, Fort.........Detroit, Mich.
West Point......West Point, N. Y.
Wetherill, Fort....Jamestown, R. I.
Whipple Barracks
Whipple Barracks, Ariz.
Whitman, Fort....LaConner, Wash.
Williams, Fort...Cape Cottage, Me.
Winfield Scott, Fort
Fort Winfield Scott, Cal.
Wood, Fort.......New York, N. Y.
Worden, Fort..........Yuma, Ariz.

Abstracts

THE EAR AND AVIATION

Isaac B. Jones, A. M., M. D.
Major Medical Reserve Corps, U. S. Army
J. A. M. A., Vol. 69: 1607

Equilibrium depends on three senses: the balance sense of the internal ear, sight, and ''muscle-sense'', that is, tendons, joints, and muscles. On ''terra firma'', two of the three are sufficient to maintain equilibrium. The ear balance sense may be impaired or destroyed by toxemia and the person be wholly unaware of the fact.

In the air, which is an entirely new environment, he relies preëminently on his ear balance sense. Normal ears are, therefore, a prime requisite for an aviator. Accidents happen, due to injury of the internal ear by sudden changes of altitude or, formerly, to defective internal ears.

Since entering the war, a tremendous number of aviators have been needed. New high standards of physical qualifications have been necessary; tests and examiners have been standardized by the Medical Corps. Vision, hearing, and above all, balance sense must be perfect. The usual requirements as to height, weight, etc., obtain.

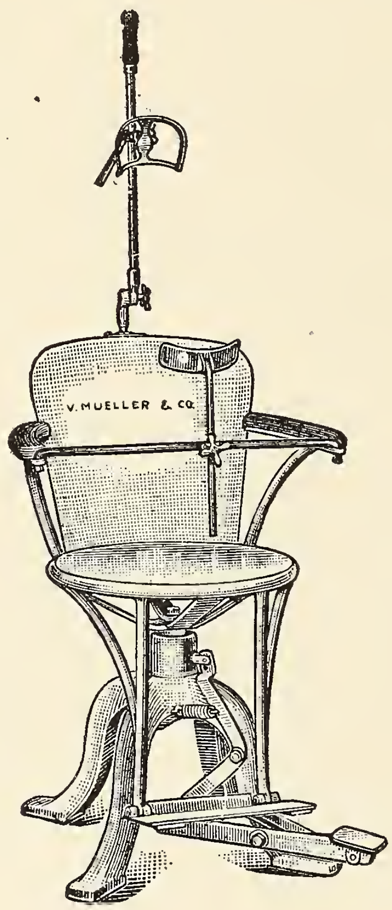
To determine his balance sense, tests are made for nystagmus, past-pointing, and falling, (1) by rotating in a chair specially devised for this purpose, (2) by the caloric method.

The Turning Tests—

(1) Spontaneous nystagmus must not be present, no matter in what direction the candidate turns the eyes. The head is now tilted forward 30 degrees, eyes closed, candidate is turned to the right, ten turns in twenty seconds,

chair is stopped quickly, eyes opened—there should occur a horizontal nystagmus to the left, of twenty-six seconds duration. A variation of ten seconds, up or down, is allowable. This is repeated, turning to the left, and the findings should be the same except that nystagmus is now to the right.

(2) Pointing. Candidate still in chair, eyes closed, faces examiner, touches examiner's finger held at arm's length in front of him, he then raises his arm to perpendic-



ular position, lowers it to find the examiner's finger. This is done first with the right arm, then with the left. A normal person finds it easily. This test is repeated after turning to the right, ten turns in ten seconds, chair stopped quickly, first the right then the left is tested until candidate ceases to past-point. The normal individual, after turning to the right, will past-point to the right. This same test is now repeated turning to the left. He should past-point, with both hands, to the left.

(3) Falling. Candidate's head inclined ninety degrees forward. He is turned to the right, five turns in ten seconds, stopping he sits up, eyes closed, falls to the right. This tests the vertical semicirculars. This is repeated, turning to the left, he should fall to the left. The accompanying cut shows the standard chair.

These tests, simple in execution, short in time, the whole series requiring but three to five minutes, separate the obviously fit and the unfit. Border line cases, that is, those in which some one of the reactions is not normal, are further tested by means of the caloric. The turning test tests both ears simultaneously, the caloric tests each ear separately. Water at 68 degrees F. is allowed to run into the external auditory canal, from a height of three feet, through a stop nozzle, with the head tilted thirty degrees forward, until the eyes are seen to jerk or the applicant becomes dizzy. The nystagmus should be rotary. This should require about forty seconds. Past-pointing is now tried as before. Head is now tilted backward sixty degrees, ninety degrees from the original position. Nystagmus now becomes horizontal to the side opposite and past-pointing is repeated. The left ear is treated in the same way. Vertigo, either after turning or douching, should be always present, but in the majority of cases it is not considered since it should be coexistent with nystagmus. In doubtful cases, however, the quantitative estimation of the vertigo is taken. This should last for twenty-six seconds. Impairment of balance sense is shown by extra time required for production of nystagmus or by abnormal responses from one or the other ear. It should be noted that all the wax should be removed from the ear before douching so that the water may reach the drum. The candidate must act naturally. Attempts to do otherwise impair results.

The things that would disqualify are failure to past-point, after douching, absence of, or pathological nystagmus, or absence of falling reaction. These tests are made necessary

and are valuable for two reasons: (1) of course, is the danger to the aviator himself, and (2) danger to service.

Dr. Jones points out that some physicians and some experienced aviators were, at first, skeptical of the value of these tests, but are no longer so. Further, he shows that the standards in the United States are higher than in other countries, and expresses the belief that because of this we should have not only the largest but the most capable aviation service in the world.

ABSTRACT FROM MAY ISSUE MISSOURI STATE MEDICAL JOURNAL

Demonstration of an Apparatus for Making Fluororoentgenography by Andre G. DeWeal, St. Louis

An ingenious contrivance that promises much in teaching and in presenting gastro-enterological problems as shown under palpation on the screen. Much difficulty will obviously be encountered in obtaining sharp definition from the reflected image in the darkened room although the problem of avoiding plate fog may be surmounted by heavy metal jacket for film case.

The following extract from author's article describes briefly the working principle.

Its principle is simple and consists of *photographing the fluoroscopic screen.* For this purpose a camera, that is, the use of a lens, has proven unsatisfactory and in its stead I employ the principle of the reflecting telescope, that is, a surface-silvered concave reflector, which collects all the light rays emanating from the screen and concentrates them into a focus. Within the focal point a suitable plate holder is inserted. The plate contained therein will be impressed

by the light rays coming from the screen and after exposure can be developed in the usual manner. If preferred, the plate holder can be substituted by a surface-silvered plano mirror which in turn reflects the rays on our film or plate which then may be placed out of the path of the rays. It may be mentioned that *true* motion pictures of the screen may be produced in the same manner, but my experiments are not completed and I shall report on this particular aspect of this apparatus later on.

The advantages of this method are, summing up shortly, the following:

We can obtain in this manner a permanent and very accurate record of the fluoroscopic examination.

We can take a picture at the exact moment desired.

The picture obtained can be made in whatever size wished, and by making it small lends itself to be reprojected on a screen, and, on the other hand, can be very readily filed.

It has furthermore the great advantage of representing an outlay which is considerably below that in the usual method of taking pictures. I may mention that twenty or more pictures may be taken at the cost of the usual 14x17 X-ray plate.

I fully realize that in this preliminary report I have omitted a great many details, due partially to time limitation, partially also to the fact that in all likelihood the method employed shall undergo considerable modification before it may be regarded as practical and perfect.

A few pictures made by this method were shown to illustrate the scope of the apparatus in its present form.

O. H. McC.

March 23, 1918, a Meeting of the Omaha Roentgen Society was held at the Hotel Fontenelle, Omaha. A dinner was given in the evening in honor of Drs. B. H. Orndoff, Chicago; M. B. Titterington, St. Louis; I. S. Trostler, Chicago; Bundy Allen, Iowa City, Iowa; O. H. McCandless, Kansas

City; and J. F. Wallace, Woodmen, Colo. The dinner was followed by an interesting program. Papers were contributed by Drs. B. H. Orndoff on a comparison of tuberculosis in children and adults and by O. H. McCandless on Deep Therapy.

A lively discussion followed each paper, Dr. Trostler leading the discussion of Dr. McCandless' essay. There were many complimentary remarks on both papers.

Dr. J. F. Wallace showed some excellent slides and gave a clear description of tuberculosis in its many phases.

All present said they were well repaid for attending the meeting. A rising vote of thanks was given those on the program.

The Omaha Roentgen Society will be glad to have members of the Western Roentgen Society in attendance at its meetings.

C. H. Ballard.

MEDICAL OFFICERS' RANK

The following article, issued by the American Defense Society, is of so great importance that we reproduce it in full. No comment is necessary. Every doctor should write his representative in Congress urging support of the bill.

The Prevention of Disease in the War

More Power for the Medical Department of the Army

LOUIS LIVINGSTON SEAMAN, M. D.

Late Surgeon Major, U. S. Vol. Engineers
Trustee American Defense Society

If the reader of this article approves its views, will he do his bit by promptly requesting his representative in Congress (House and Senate) to support the pending bill.

The bill now pending before Congress for the reorganization of the Medical Department of the Army is of as grave

importance as any measure that has been presented since the American nation entered the present war, and its fate *may* determine the final issue of the war. When it is remembered that the Medical Department has to combat a foe, that in all the great wars of history, excepting the Russo-Japanese, has caused 80 per cent. of the entire mortality—never less than four times, and often twenty times as many as the artillery, infantry, shells and all other methods of physical destruction combined, the responsibility and importance of the medical officer in war will be appreciated.

The Department he represents has never had the necessary authority to enable it to reduce this frightful eighty per cent mortality to a minimum, and to do so without in any way interfering with the strategy, or military operations of the war.

The Medical Department of our Army is founded on the traditions of the British Medical Department of 1776, when preventive medicine was an unknown science, and the duty of the medical officer was to cure disease, instead of preventing it—of locking the stable door after the theft had been committed.

Our medical officers have never had the necessary rank and authority to prevent the development of the epidemics and other diseases in our Army that have caused the frightful mortality incident to war. Witness the records of the Spanish-American War in Cuba and Porto Rico and in the Philippines, which practically typify the conditions that existed in the Boer War in South Africa, in our own Civil War of '61–'64, in the Russo-Turkish War, and in the British campaign in the Crimea.

The Porto-Rican Expedition in the opera bouffe performance known as the Spanish War may be taken as an example, for nowhere in history is there found a more illuminating instance, a graver lesson, or a more terrible warning than is there portrayed. For our country, it is the "Mene,

Mene, Tekel Upharsin,"—the handwriting on the wall, so easily decipherable that he who runs may read; and yet, in the glory of victory, and the enjoyment of prosperity, its lesson has passed unheeded.

The story of the expedition is brief. About 20,000 American troops landed in Porto Rico, while the Spanish on the island numbered about 17,000. Several skirmishes occurred, in which, *according to the Surgeon General's report*, three men were lost from the casualties of war. The object of the war, the breaking of the chains of Spanish despotism and spoliation, which for centuries had held a race in shameful moral serfdom, was soon accomplished, and the war—from the strictly military standpoint, was over. From our first arrival, the natives of the island welcomed our battalions with vivas of applause, strewing our advancing march with flowers, and their masses were prepared to joyfully second our efforts for their complete emancipation.

That is the beautiful story history presents. Lest we forget as a Nation, and lie supine in the easy content of this picture, let me invite attention for a moment to a further study of the report of the Surgeon General for that war. It states that, although only three men fell from the casualties of battle during that entire campaign in Porto Rico, 262, or nearly one hundred times as many, died from preventable causes. It fails, however, to state that the number of hospital admissions nearly equaled the entire strength of the invading army, and that the camps of the army, from one end of the island to the other, were pestiferous hotbeds of disease, before they had been occupied a month; so that, had the bugle sounded for action, only a small percentage of the units would have been in a condition to respond to the call. Nor was this state of affairs confined to Porto Rico. In the invading armies of the Philippines and Cuba the same conditions prevailed.

The official figures as shown on the following table were furnished me *by the Surgeon General of the Army,* on the

10th day of October, 1905, and cover the vital statistics of the United States Military Expeditions for the year 1898.

	Death from Casualty	Died from Disease
In the Philippine Islands........	17	203
In Porto Rico..................	3[1]	262
In Cuba	273	567
In the U. S. Home Camps, etc....		2,649
Total deaths................	293	3,681

Or about one from casualties to thirteen from disease.

The report further shows that while the average mean strength of the army enlisted for the Spanish War was about 170,000, the total number of admissions to the hospitals was on September 10, 1898, over 158,000, or 90 per cent. This in a war of less than three months duration, and in which more than three-fourths of its soldiers never left the camps of their native land.

The Japanese army for the same period had about 4 per cent. hospital admissions, or one twenty-second as many.

The vast difference in favor of the Japanese figures illustrates the value of a medical and sanitary department properly equipped to enforce practical sanitation, dietary, and other preventive measures.

The greatest tragedy of war lies not on the battle field but in the failure of a government to protect its guardians from *preventible* diseases, thereby immeasurably increasing the suffering and mortality incident to it. This can be largely prevented by giving the medical officer authority to enforce sanitation, and supervisory control over the rations of the troops.

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[1] Two of these deaths resulted from a stroke of lightning in a thunder storm.

Every death from preventable disease is an insult to the intelligence of the age. If it occurs in the army, it becomes a governmental crime. From the beginning the State deprives the soldier of his liberty, prescribes his hours of rest, his exercise, equipment, dress, diet, and the locality in which he shall reside; and in the hour of danger it expects him, if necessary, to lay down his life in defense of its honor. It should, therefore, give him the best sanitation and the best medical supervision the science of the age can devise, be it American, Japanese or Patagonian,—a fact of which Congress will do well to take cognizance at the earliest moment. For, just as surely as the engineer who disregards the signals, or the train dispatcher who gives wrong orders, is legally responsible for the loss of human life in the wreck which follows, so Congress, or the medical system of our Army, is responsible for all soldiers' lives that are needlessly and criminally sacrificed,—not on the glorious field of battle, but in diseased camps, from preventable causes.

Herbert Spencer, in his "Synthetic Philosophy," refers to "the ill treatment accorded the medical officers of the English Army as a late survival of the days of feudalism, and contempt for the purely scientific."

If wars are inevitable, and the slaughter of men must go on (and I believe wars are inevitable, and that most of them are ultimately beneficial), then let our men be killed legitimately on the field, fighting for the stake at issue, and not dropped by the wayside from preventable disease, as they did in the Spanish-American War—1,300 for every 100 that died in action. It is for the 1,300 brave fellows who are needlessly sacrificed, *never* for the 100 who fall gallantly fighting, that I offer my prayer.

I believe that if our Medical Department in the Spanish-American War had been systematized, with sufficient numbers, *with supervisory control over the ration, and with*

power to enforce sanitary and hygienic regulations, the men of our army would have returned to their homes at the close of the campaign, in better physical condition than when they entered it, improved by their summer outing.

An army might be suffering from diarrhea or slight intestinal catarrh, due to change of water, of ration, or climate (and I have seen 90 per cent. of an entire command in this condition at one time), compelled to live on a diet of pork and beans and fermented canned rubbish that in six weeks prostrated 50 per cent. of its number with intestinal diseases, and sent three thousand to their everlasting homes, to say nothing of the enormous number invalided, and the seventy-five thousand pension claims that followed as the result. Until the men were admitted to hospital wards the medical officer had no authority to even order a rice diet, which would have prevented the men from becoming invalided. *This was one of the principal causes that brought our army of 170,000 men in the Spanish War almost to its knees in three months, and sent the survivors home in the shrunken and shriveled condition which many of us still remember.*

In all the wars in which the United States have engaged, disease has been responsible for more than 70 per cent, of the mortality, more than half of which could have been easily prevented, had the Medical Department been properly empowered to meet its obligations. *Preventable disease, more than wounds, swells the pension list.* Statistics of the Pension Officer prove that if this unnecessary loss had been avoided, the saving in pensions alone, in every war in which America has participated, would have paid the cost of the resulting war in every twenty-five years. Aside from the sorrow of the homes made desolate, consider the economic value of the 70 per cent. of lives needlessly sacrificed, that might have been saved as breadwinners in industrial pursuits.

In an address delivered before the International Congress

of Military Surgeons in 1904, after my return from the Russo-Japanese War, I said:

"Perhaps the day is not distant when another summons will come to join the Army of the Republic, when the first call may be, not as in the Civil War for 75,000 men, nor as in the Spanish War for 250,000, but when more likely it will be for a round half million, to be followed possibly by another of equal number. And the question will be asked by the young patriot of that day, not 'who is the enemy to be met,'—no, the American boy is not built that way—but he will demand to know *what measures have been taken to insure him against the silent enemy that kills the eighty per cent.* And when he learns the same prehistoric regulations as to sanitation and protection against this foe are in force as existed in 1904, will he respond to his country's call? Yes, he will—for that is the way the American boy is built. And he will follow, as did his forebears, in their footsteps; and he will fall by the wayside as they did before. And history will record another crime."

"We see by the light of thousands of years,
And the knowledge of millions of men,
The lessons they learned through blood and in tears
Are ours for the reading, and then
We sneer at their errors and follies and dreams,
Their frail idols of mind and of stone,
And call ourselves wiser, forgetting, it seems,
That the future may laugh at our own."

Give the Medical Officer rank, and *authority,* in all matters appertaining to sanitation and preventable disease, and supervision over the ration, when such authority will not interfere with the strategy of the officer of the line; and then, if epidemics or other preventable diseases occur, have him court-martialed and cashiered from the Army, as though he were a traitor and a spy.

Respectfully yours,

LOUIS LIVINGSTON SEAMAN,

Late Surgeon Major U. S. Vol. Engineers.

Spartanburg, S. C., March 28, 1918.

WAR DEPARTMENT, OFFICE OF THE SURGEON GENERAL

Washington, April 8, 1918.

MEDICAL RESERVE CORPS

To the Editor:

1. I wish to call to the attention of the profession at large the urgent need of additional medical officers. As the war progresses the need for additional officers becomes each day more and more apparent. Although the medical profession of the country has responded as has no other profession, future response must be greater and greater. The department has almost reached the limit of medical officers available for assignment.

2. I am, therefore, appealing to you to bring to the attention of the profession at large the necessity for additional volunteers. So far the United States has been involved only in the preparatory phase of this war. We are now about to enter upon the active, or the fighting phase, a phase which will make enormous demands upon the resources of the country. The conservation of these resources, especially that of man-power, depends entirely upon an adequate medical service. The morning papers publish a statement that by the end of the year a million and a half of men will be in France. Fifteen thousand medical officers will be required for that army alone. There are today on active duty 15,174 officers of the Medical Reserve Corps.

3. Within the next two or three months the second draft will be made, to be followed by other drafts, each of which will require its proportionate number of medical officers. There are at this time on the available list of the reserve corps an insufficient number of officers to meet the demands of this draft.

4. I cannot emphasize too strongly the supreme demand

for medical officers. Will you give the department your assistance in obtaining these officers? It is not now a question of a few hundred medical men volunteering for service, but it is a question of the mobilization of the profession that in the large centers of population and at other convenient points as well as at all army camps and cantonments, boards of officers have been convened for the purpose of examining candidates for commission in the Medical Reserve Corps of the Army. An applicant for the reserve should apply to the board nearest his home.

5. The requirements for commission in the Medical Reserve Corps are that the applicant be a male citizen of the United States, a graduate of reputable school of medicine, authorized to confer the degree of M. D., between the ages of 22 and 55 years, and professionally, morally and physically qualified for service.

6. With deep appreciation of any service you may be able to render the department, I am,

J. C. Gorgas,
Surgeon General, U. S. Army.

ROENTGEN RAYS AS AN AID IN THE DIAGNOSIS OF ULCUS VENTRICULI

The American Journal of Medical Sciences
May, 1918; Vol. CLV, No. 5, pp. 713–741

I. W. Held, M. D., and M. H. Gross, M. D.
New York City

The authors present an exposition of the indirect method of stomach examination by roentgenoscopy and emphasize its value in the differentiation of other abdominal conditions with gastric symptoms. The following physiological phenomena are described according to roentgenological con-

ceptions, (1) position and form of stomach; (2) tonus and peristalsis; (3) gastric secretion; (4) mode of filling and motility; (5) mobility. In diagnosis the following factors are observed, (1) mode of filling, position and peristalsis; (2) sensitive pressure points; (3) secretions; (4) standing contractions (persisting contractions); (5) time of emptying. The factors vary in value with the tonicity of the stomach.

The stomach is regionally divided according to Forsell, to whom is given the further credit for showing that the form and position of the stomach are due to its musculature and tonus. The whole stomach is divided into the saccus digestorius including all that part of the stomach except the pyloric antrum which is called the canalis egestorius. The saccus is subdivided into the fornix (fundus), corpus (tube) and sinus. Two forms of stomach are mentioned, one, the pipe shaped or siphon type in which but a small part of the pyloric portion is at the right while the low point is at or slightly below the crest of the ilium. This type is found in the asthenic person and is the result of the uniform contraction of the entire stomach. The other form, found in wide chested people or those who for any reason have increased intra-abdominal pressure, is situated high, transverse in direction with the pylorus and part of the antrum at the right. This ''bull horn'' type is brought about by strong muscular contraction in the sinus and corpus stimulated by pressure of surrounding organs.

Of first importance in normal peristalsis is the absence of waves for four to six minutes while the stomach is filling and thereafter the regular succession of contractions at the rate of four to six every minute.

Gastric secretion is demonstrated according to E. Schlesinger by the appearance of an intermediary layer between the airbag and the corpus which is lighter in color than the contrast substance. This normally appears only during the beginning of digestion.

In the normal stomach the process of filling may be observed. Each morsel is seen to enter the stomach and traverse its length to the sinus until about five tablespoonfuls have been taken after which filling distends the stomach transversely but not longitudinally.

The emptying time for the Reider meal is three to six hours, stomachs of the bull horn type emptying faster than the pipe shaped.

Fluoroscopic observation of a simple ulcer stomach shows during the ingestion of a meal that the entire stomach fills gradually while peristalsis is almost immediate and rapid throughout, the period of repose being greatly shortened or entirely missing. The waves are of a standing or lasting nature, indicating that they have been converted into spastic contractions. The intermediary layer of Schlesinger is exaggerated and has been observed to be most marked in the region of the ulcer. In roentgenologic study of simple ulcer in ortho- or hypertonic stomachs the most striking and valuable feature is the standing or persisting contraction. However, such incisurae may result reflexly from inflammations elsewhere in the abdomen and such must be excluded. Persisting contractions are also met in vagotonia where the stomach is orthotonic or hypertonic. Atropin or tincture of belladonna for two to three days will relax these spasms. Stimulation from pressure of enlarged spleen or distention of the splenic flexure will cause confusing contractions. The organic changes, as cancer and syphilis, must not be confused with the spastic contraction of simple ulcer. Cardiospasm and pylorospasm with similar care in differentiation are valuable signs and point to localization.

Finally the emptying period is prolonged proportionate to the nearness of the ulcer to the pylorus.

In the hypotonic stomach the phenomena are changed by the relaxed stomach wall. The stomach fills from below upward and the pylorus and sinus contain most of the food.

All of the pylorus and some of the sinus are at the right in contrast to the hypotonic stomach without ulcer. Peristalsis begins early and in the sinus and pylorus is very marked. The intensity and duration are only transient, however. The secretions are large, filling the corpus and part of the sinus. The standing contraction has comparatively little value while the cardiospasm and pylorospasm have more direct value than in the hypertonic stomach. A six-hour residue is found when the ulcer is near the pylorus but all residues are less than in the hypertonic organ.

In differential diagnosis especial attention is called to the gastric phenomena seen in connection with chronic appendicitis. Here, however, prolonged fluoroscopy shows all the appearances which would be indicative of ulcer to be transient. Of most significance is the emptying time which is normal. Vagotoniacs often give roentgenological findings simulating those of ulcer and only repeated examinations showing the instability of the signs can rule out the condition especially in the knowledge that these people are often subject to ulcer. Consistent negative findings in examining for ulcer are of value in neurotic cases with gastric symptoms.

In ulcer complicated by excessive connective tissue formation, penetration and adhesions to surrounding viscera the roentgen ray directly visualizes the existence of the ulcer and its location as well, in the great majority of cases.

The presence of the indurative and penetrating ulcers is marked by a diverticulum or niche of contrast substance at the site of the ulcer. Exceptionally the ulcer may be on the anterior or posterior wall and require that the meal be given in some special position to insure the filling of the diverticulum. In exposing for the anterior niche the abdomen should be nearer the plate and for the posterior the reverse position. In the penetrating form the niche is surmounted by an airbag and both niche and airbag may still be seen after the stomach has emptied. The belief is ex-

pressed that the callous ulcer is found more often in the ortho- or hypertonic stomach while the penetrating form is the usual type in the hypotonic organ. Excessive callous, carcinoma, or syphilis may result in organic hourglass stomach. Where due to ulcer of the corpus the cardia is seen to fill at once and food goes into the sinus in small driblets. In carcinoma the two portions of the stomach fill simultaneously owing to the rapid passage through the defect. The intervening space is rough and irregular, and the same may be said of the syphiltic stomach. Tumors of the neighboring organs, enlarged spleen as well as gas in the splenic flexure may give rise to appearances resembling hourglass stomach through the strong stimulus to contraction afforded the stomach muscles by the external pressure. Callous ulcer near the pylorus results in varying degrees of stenosis and is shown to the fluoroscopist as inactivity of the vestibule while the sinus and tube are the site of greatly increased peristaltic activity. The food stream through the pylorus becomes a very thin stream. In complete obstruction the characteristic half moon or boat shape is quickly shown but such a stomach never empties. The adhesions frequently found about the pylorus which is the seat of callous ulcer cause bizarre deviations of the vestibule and failure to follow the respiratory movements. The sensitive pressure points are of increasing value in the presence of adhesions, while extensive posterior adhesions may give the stomach form of the anatomists, the high transverse stomach with pylorus pointing to the rear.

C. E. R.

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THE JOURNAL OF ROENTGENOLOGY

Published by the Western Roentgen Society, Inc.

VOLUME I Second Quarter, 1918 NUMBER 2

CONTENTS

THE JOURNAL OF ROENTGENOLOGY is the official publication of the Western Roentgen Society, Inc., and is published under the authority of the Society.

Address communications and manuscripts for publication to the Editor, Dr. Bundy Allen, Iowa City, Iowa.

Subscription rate—$5.00 per year, $1.50 per copy.

THIS PAGE WILL BE GIVEN IN EACH ISSUE OF THE JOURNAL FOR ANY SPECIAL ANNOUNCEMENT THAT THE PRESIDENT OF THE ORGANIZATION MIGHT HAVE FOR THE MEMBERS OR THE READERS.

To the Readers of the JOURNAL:

Almost every Roentgenologist feels deep concern at the present time as to what decision he should make regarding entering military service.

Roentgenologists as a class certainly possess a full measure of patriotic spirit and are thoroughly accordant with the justice of this war and the principles Americans stand for, whether during war or peace.

A government existing ''by the consent of the governed'' fights by the consent of the governed also, and as a class, Roentgenologists are not only willing but anxious to do their part.

From the nature of their work, Roentgenologists are trained in conservatism and when a problem presents itself, they are found to be calmly qualifying for an honest and proper decision.

True to the very fabric in the foundation of our government, Roentgenologists are asked to consider accepting a commission in the Medical Officers Reserve Corps. Other governments might draft Roentgenologists or medical men generally and while if our war continues indefinitely, we as a class may be classified; certainly as a class we will not be drafted, as such seems impossible under our present constitution.

The demand for any one class of workers is placed fairly

before them and it becomes a natural and pleasant duty for each to carefully consider his particular situation and act in accordance with his calm judgment.

As the demand becomes more pressing, Roentgenologists are given the information accordingly and such steps seem to me to be the plan adopted by those in charge in the Surgeon General's office and are in my judgment consistent with the best and most democratic principles of government.

The temper of the present demand is very clearly and honestly cited in a letter from Colonel A. C. Christie, Chief of the X-Ray division in the Surgeon General's office, Washington, D. C., which was read before the mid-annual meeting of the Western Roentgen Society in Colorado Springs and printed elsewhere in this issue of the JOURNAL.

The present officers of the Association have endeavored to provide such information to its members as they might desire concerning this situation. By far the majority of the questions received to date are answered in Colonel Christie's letter.

Certain problems, however, have not been touched upon so fully by Colonel Christie, which I think it would be well to discuss at this time. These problems refer directly to just what constitutes adequate reason for not joining the M. O. R. C. Certain of our members have intimated that they must face slurring remarks from patriotic enthusiasts, because they have decided, after exercising their best judgment, that the urgency of the present demand does not warrant the sacrifice and disturbance occasioned by enlisting.

The following quotation in a recent letter from the Surgeon General's office may elucidate this particular phase better than my own statements: "The Surgeon General in no sense feels or states that a medical man, after giving due consideration to his family and financial responsibilities, comes to the conclusion that he could not enter the

service at this time is in any sense or degree a 'slacker'. The Surgeon General believes that the younger men who have no such ties and who can be spared should volunteer their services and apply for a commission and so many of the older men of the profession who are singularly situated and whose responsibility, professional and financial obligations will permit them to volunteer their services should do so in order that a competent and accomplished personnel be supplied to the Medical Reserve Corps. The Surgeon General does not believe that men, who have consistent, conscientious and sane reasons do not apply for a commission, are slackers or that the profession or community should take that attitude towards such men. . . . The Surgeon General appreciates the effort which the profession is making to supply the necessary personnel for the Medical Reserve Corps. However, he does not wish any physician to make application for commission if by so doing any community would be deprived of the necessary and competent medical attention or that any civil institution or industry of importance would be deprived in a like manner."

In conclusion the writer wishes to state that he believes that as the call for Roentgenologists is extended, it should be carried out under a compulsory selective service act, which as outlined repeatedly in the columns of the Journal of the American Medical Association would secure the desirable number of physicians at any time with the minimum amount of disturbance in local fields.

GUARDING THE HOMELAND

We are the garrison guarding the homeland,
We who remain when the troops march away.
Steadfast, we turn to the task that awaits us,
Lifting the burden anew every day.
One to the counter and one to the kitchen,
One to the cradle and one to the loom;
Each in his own place a service can render,
Each in his own place—and ample the room!

We are the garrison guarding the homeland,
Foes to extravagance, idleness, waste,
Allies of industry, order, economy,
Working with cheerfulness, diligence, haste.
One in the hospital, one in the school-room,
One in the office and one in the field.
Holding the fort of Democracy's stronghold
'Gainst every force that a despot can wield.

We are the garrison guarding the homeland,
Close up the ranks, then, nor stop to bewail.
This is no time for complaint or repining,
Seize Opportunity! Dare not to fail!
One with the motor and one with the needle,
One with a garden and one with a pen;
All for humanity banded together,
Holding the fort till Peace comes again.

Ida Reed Smith.

Courtesy of George J. Haberer

CALCIFICATIONS*

E. B. Knerr, Sc. D., M. D.
Roentgenologist at The Research Hospital, Kansas City, Mo.

By calcifications is meant the deposit of lime bodies. Such deposits may occur in the various organs and tissues anywhere in the body. In the broadest sense they may include ossifications whether normal, as in all bone structures, or pathological, as exostoses; for an essential element ingredient in all is calcium. However in the present paper I wish to refer briefly to certain deposits other than bone formations.

Conspicuous among such limy deposits are certain types of gall stones, kidney stones, bladder stones, calcified tubercular, neoplastic and inflammatory degenerations, and possibly some other conditions.

The deposit of lime salts about a center, usually a particle foreign to the structures involved, is a common phenomenon in mineral and vegetable as well as in animal bodies. Water charged with mineral salts percolating through rock strata will gradually transform the mineral deposits therein, working them over by molecular substitutions into entirely new mineral structures yet retaining the former crystalline shapes. Thus arise the "pseudomorphs" of mineral crystals. Water charged with lime salts and silica percolating through animal and vegetable remains will gradually by molecular replacement turn over the organic cellular structure to one entirely mineral, yet retain the minute tissue form of the original plant or animal. Such a process is "fossilization".

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*Read before the Roentgen Club of Kansas City, March, 1918.

Likewise in the structures now claiming our attention the lime in the blood and lymphatic fluids bathing the parts affected may be deposited or be appropriated as either replacement of cells and tissues, or it may be disposed in layers as concentric shells about a foreign body as a nucleus or center.

Stones of the Bladder, Gall Bladder, and Kidney are frequently of such a concentric structure. On the other hand the calcareous spicules and plaques associated with degenerating tissues are of the replacement type of formation. A pyogenous, cystic Kidney for example will frequently contain irregular spicules of a calcareous mineral substance. These are not true stones. (Figs. 1 and 2.) They are rather of the nature of fossils and result from the molecular replacement by lime in the mummified masses of dead degenerated cells. The same applies to the calcareous deposits in disintegrating neoplasms, notably carcinoma (Figs. 3 and 4), and to the like deposits in the walls of chronically inflamed veins, producing the so-called calcified veins (Fig. 5). On the other hand, kidney stones and phleboliths are concretionary in structure, built up by layers on the outside concentrically over a nucleus. (Fig. 6.)

Sub-acromial limy infiltrations (Fig. 7), sternocostal calcifications (Fig. 8), joint deposits (Fig. 9), are of the replacement type of formation, the lime salts replacing other salty deposits (possibly urates) and inflammatory organic by-products, synovial fibrin and coagulum.

In this connection I wish to call attention to certain deposits which on gross observation may be passed as calcareous but which may be readily proven to contain no lime whatever if a roentgenogram be made of the part. Sclerotic arteries are frequently spoken of as "loaded with lime", veritable "pipestems". A radiogram may prove them to contain no lime whatever. To test this I recently made plates by the ray of a number of museum specimens of sclerotic aortas and arteries and found no lime in any of

them Also text pathologies speak of ''calcareous plaques'' or scales as imbedded in the dura of the spinal cord, and as covering the cord. Has anybody ever proven by radiograms that such plaques are composed of lime deposits? Recently by the kindness of Dr. Skoog of Kansas City I had the good fortune to study such a specimen of a cord almost shingled over by glistening white scales, which all observers spoke of as ''limy deposits''. To prove whether the scales really contained lime I made several radiograms of the specimen. (Fig. 11.) It will be readily seen that lime is entirely absent when the radiogram is compared with the direct photograph of the specimen (Fig. 12). Chemical test of the scales proved them to be entirely combustible, leaving no ash, as would have been the case had there been any appreciable content of lime present. The scales were really horny in structure and gave the chemical tests for keratin, and should be classed as neurokeratin.

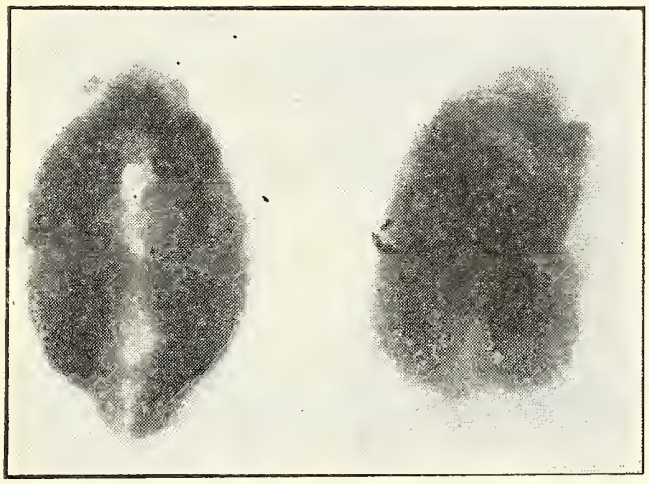

Fig. 1. Operated Kidney showing lime spicules and concentric deposits about pus cavities in the Cortex. These are of the replacement type, mummified dead cells being replaced by lime salts. These are not Kidney stones though they may possibly become nuclei about which true Kidney stones may be formed by concentric deposits.

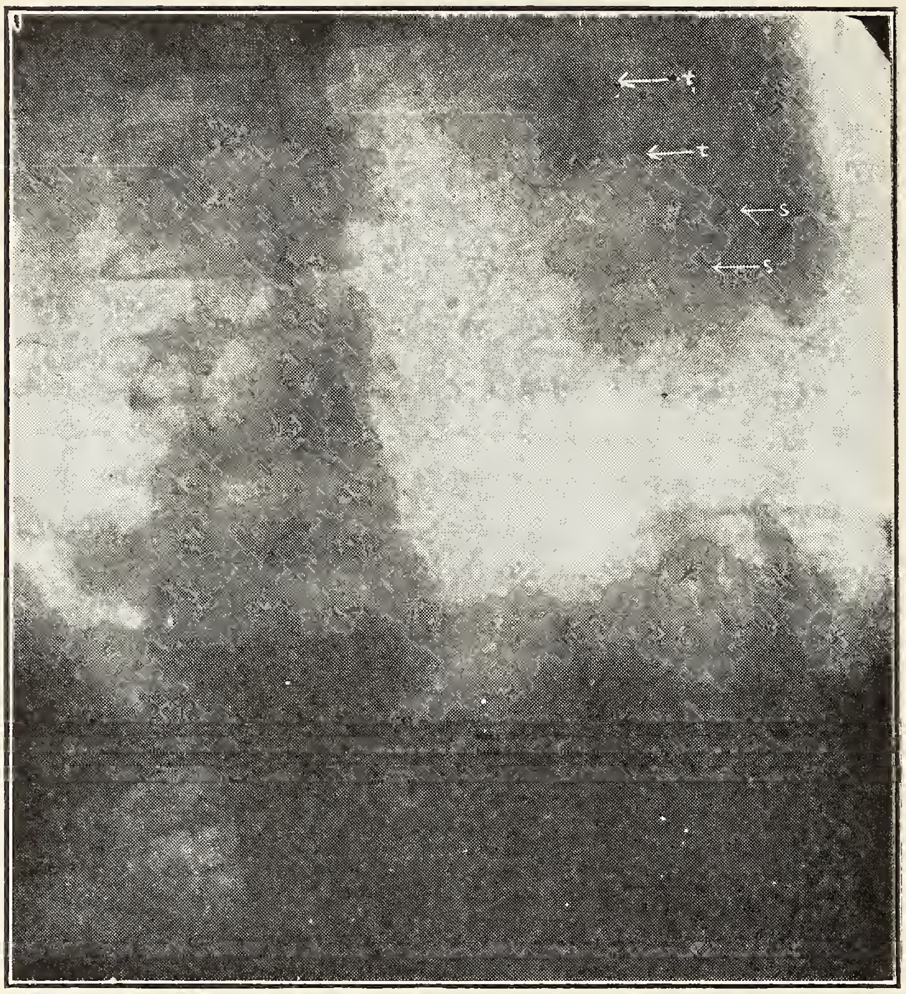

Fig. 2. Purulent Kidney. Replacement lime spicules at arrows marked *s*. Arrows marked *t* point to pelvis of the Kidney injected with thorium sulphate. This is the same case as Fig. 1 showing the Kidney after operation.

Fig. 3. Operated Goiter. Malignant and of Endotheloma type. The lime spicules are of the replacement type as in Fig. 1.

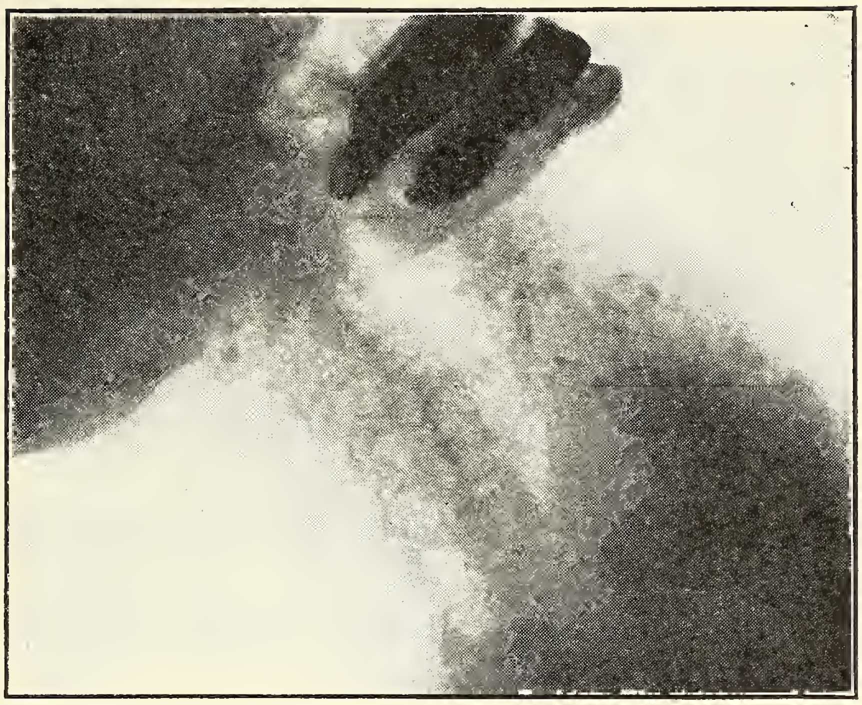

FIG. 4. Goiter. Epithelioma of the goiter presents numerous calcareous spicules of the replacement type. These calcareous deposits in goiter are usually indicative of malignancy.

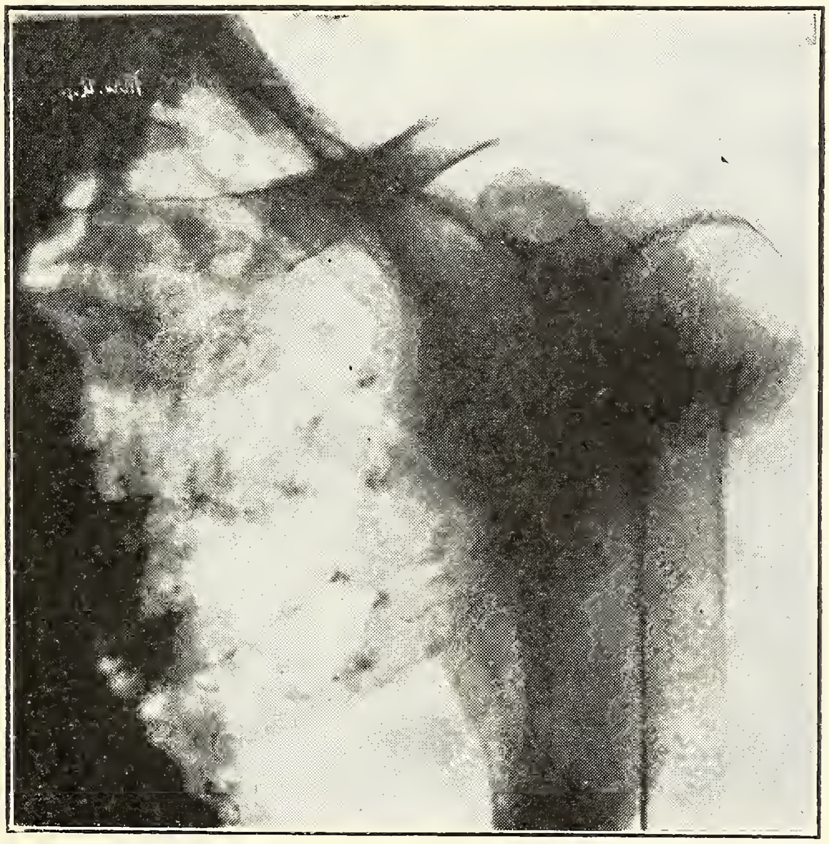

FIG. 5. Extentive calcifications in the veins of the chest in a lady 90 years of age.

FIG. 6. True Kidney stones of calcareous concretionary form.

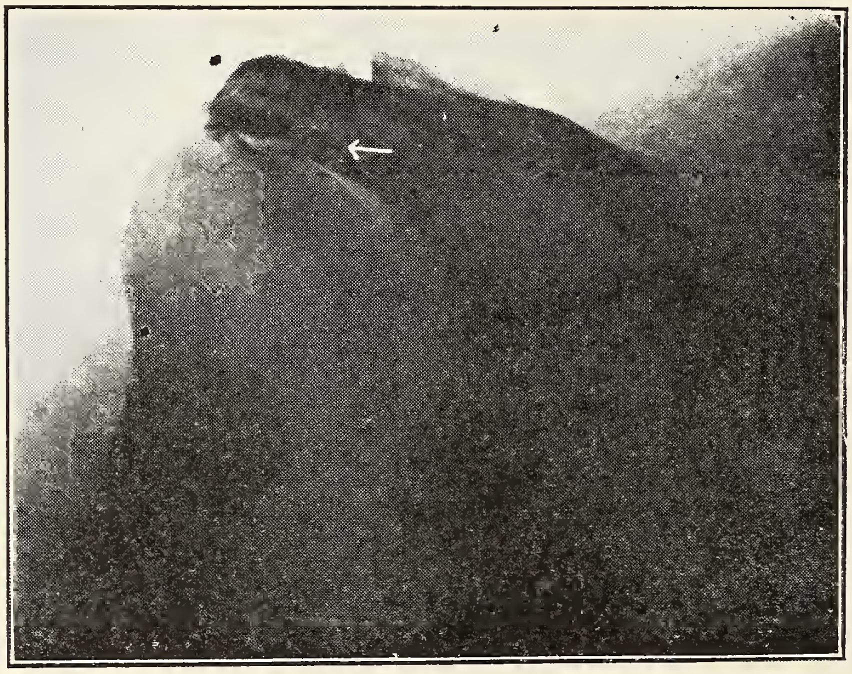

FIG. 7. Sub-acromial calcareous deposit of the infiltration replacement type.

FIG. 8. Calcareous deposits in sterno-costal cartilages. A result of inflammation, in this case attended by infection which gave a purulent discharge for 13 years. Probe placed in the discharging sinus leads to the infected calcareous deposit.

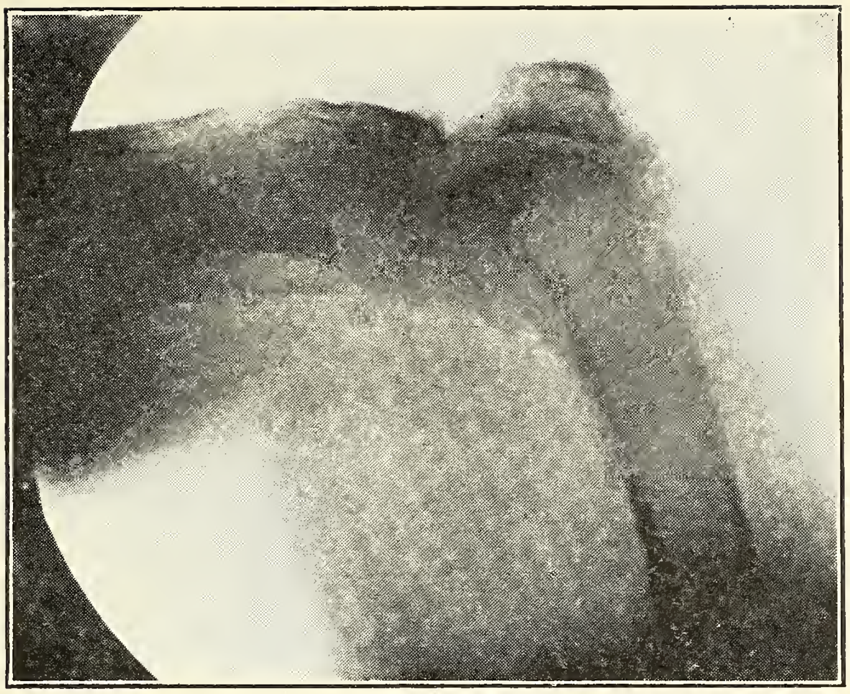

Fig. 9. Inflammatory calcareous deposits in the knee joint. These are of the replacement type, organic precipitates having been replaced by calcium salt deposits. See Fig. 7.

Fig. 10. Lime deposits in callus. Replacement type organizing into true bone.

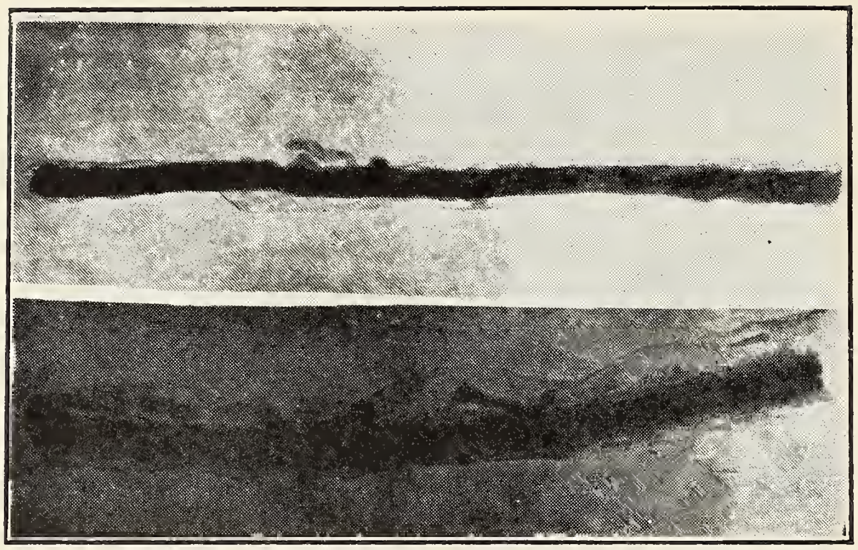

FIG. 11. Two radiogram views of spinal cord of which Fig. 12 is a photograph. Note no evidence of lime in the structure.

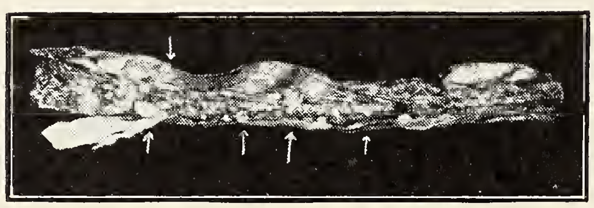

FIG. 12. Photograph of Spinal Cord covered by numerous white plaques which were described as ''calcareous'' but which proved to be entirely free of lime. The plaques are shown at arrow points. See Fig. 11.

IMPROVED MODEL OF THE GRANGER LOCALIZER

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The localizer consists of four separate parts: an aluminum base plate, an upright standard, a pointer and a small fluorescent screen with its adjustments.

The base plate has at one extremity a square opening containing a metal cross, and the other extremity is shaped to receive the base of the upright standard. On the upper surface of the plate is a scale in divisions of one-quarter inch, the zero point being at the intersection of the cross (H). Running the full length of its under-surface and embedded in it, are three bars of one-eighth inch brass. These bars, together with the three small ones which run at right angles to them, one in the center, the other two at the sides of the square opening in the base plate, produce the grid appearance seen on the fluorescent screen (Fig. 3); also the center cross shadow and the long central and lateral guide shadows (Figs. 4–15) referred to throughout this article.

The upright standard has a base which is fitted to and is movable longitudinally on the base plate, at a given point of which it can be firmly fixed by means of the thumb-screw (L). A key way running the full length of this upright standard receives the gib of the carriers (M M′). The latter are movable vertically on the upright standard and can be fixed at a given point on it by means of thumb-screws (P P′). The lower carrier has a sleeve to receive a pointer, the upper one has a sleeve to receive the bar which is attached to and holds the small frame (N). This frame con-

tains a small fluorescent screen covered on its upper surface with a sheet of lead glass, and on the under surface with a thin sheet of aluminum. The screen and its two coverings are held firmly together in this frame and their exact center is pierced by a round hole one-quarter inch in diameter (X). The pointer and the holding bar for the screen can be made to slide within their respective sleeves and can be fixed at a given point within these by means of the thumb-screw (V V′). One end of the pointer has a sharp concave surface to mark the skin of the patient. The upright standard has a scale marked in divisions of one-eighth inch, the zero being on the upper surface of the base plate, and the scale is read at the top of the carriers. The scale reading at —Y— measures the distance from the upper surface of the base plate to the center of the pointer. The scale reading at —Y′— measures the distance from the upper surface of the base plate to the under surface of the screen (N).

From the foregoing description it is clear that a vertical movement can be imparted to the pointer and to the screen by moving their respective carriers on the upright standard, and a horizontal movement, by sliding the pointer and the supporting bar within their respective sleeves. Also that the distance from the upper surface of the base plate to the under surface of the screen (scale reading at Y′) is equal to the thickness of the part being examined when that part lies on the base plate and the screen rests on the former.

To locate a foreign body it is necessary to have besides the complete localizer, a transparent top table and an X-ray tube held in an X-ray proof container movable under this table.

Any horizontal trochoscope, or X-Ray table with a tube held in an X-ray proof container movable under it, such as are used for horizontal fluoroscopy, fills the requirements fully.

The patient lies on this table and the part containing the

foreign body is placed and held in the position in which it will be held during the operation for the removal of the foreign body. The X-ray tube container with its diaphragm closed so that only a small area of fluorescence, say about two inches in diameter, appears on the small screen (N) previously placed on the patient is moved under the patient until the foreign body is seen clearly in the center of this small fluorescent area (Fig. 2). The aluminum plate of the localizer is now slipped under the patient until the shadow of the intersection of the metal cross (H) coincides with the center of the shadow of the foreign body (Fig. 3). The upright standard is then moved along the base plate until the end of the sleeve holding the pointer is about two inches away from the side of the patient.

The bar holding the small screen is now slipped in the sleeve of its carrier and when the latter is adjusted with the screen lying flush on the patient, the hole in the center of the screen, the center of the foreign body and the center of the cross in the base plate should coincide. A mark made on the skin of the patient through the hole in the screen will give us the upper end of a vertical line passing through the foreign body. This mark having been made, the tube is shifted until the center of the foreign body shadow moves from the center of the central guide shadow to the center of one of the lateral guide shadows (Fig. 6). Without disturbing the relation of these shadows the small screen and the tube are moved in the direction of the longitudinal guides and towards the upright standard until the shadow of the pointer is seen on the screen. The pointer is now raised until its shadow merges with that of the same lateral guide shadow on which the shadow of the foreign body is now lying (Figs. 7–6). The pointer is now lying in the same plane as the foreign body and the side of the patient is marked by pressing the sharp concave end of the pointer against it, indicating the outer end of a horizontal line pass-

ing through the foreign body; or in other words, the depth of the foreign body in the tissues.

Reading the scale on the upright standard at Y, we get in one-eighth inch divisions the distance of the center of the foreign body from that part of the patient lying on the base plate, and the difference between the scale reading at Y and at Y′ is equal to the distance from the foreign body to the mark made on the patient through the small hole in the screen.

Reading the scale on the upper surface of the base plate, we get in one-quarter inch divisions the distance from that part of the patient against which the sharp end of the pointer was pressing to the center of the foreign body. This reading should be made with the pointer carrier (M) lowered to the lowest point on the upright standard.

The Localizer Is Self-Correcting

Because of the long guide shadows produced by the long metal bars running the full length of the aluminum plate, it is possible to correct any errors which may result from a very small foreign body, from an improper centering of the tube, or from a defective or injured localizer, that is, one in which the pointer or the screen center, or both, are out of alignment. If the foreign body is so small that its shadow merges in the shadow of the central guide, move either the tube or the aluminum plate until the foreign body is seen lying just below the central guide (Fig. 8). Note the relation of the shadow of the pointer to this same central guide (Fig. 9), and when the tube is shifted cause the foreign body shadow to lie just below that of one of the lateral guides (Fig. 10), and when you move the pointer you will cause its shadow to assume with this same lateral guide shadow the identical relation it bore to the central guide (Fig. 11). The shadows of the foreign body and of the pointer having been made to travel an equal distance for the same shifting

of the X-ray, these must lie on the same level, that is, they are now parallel.

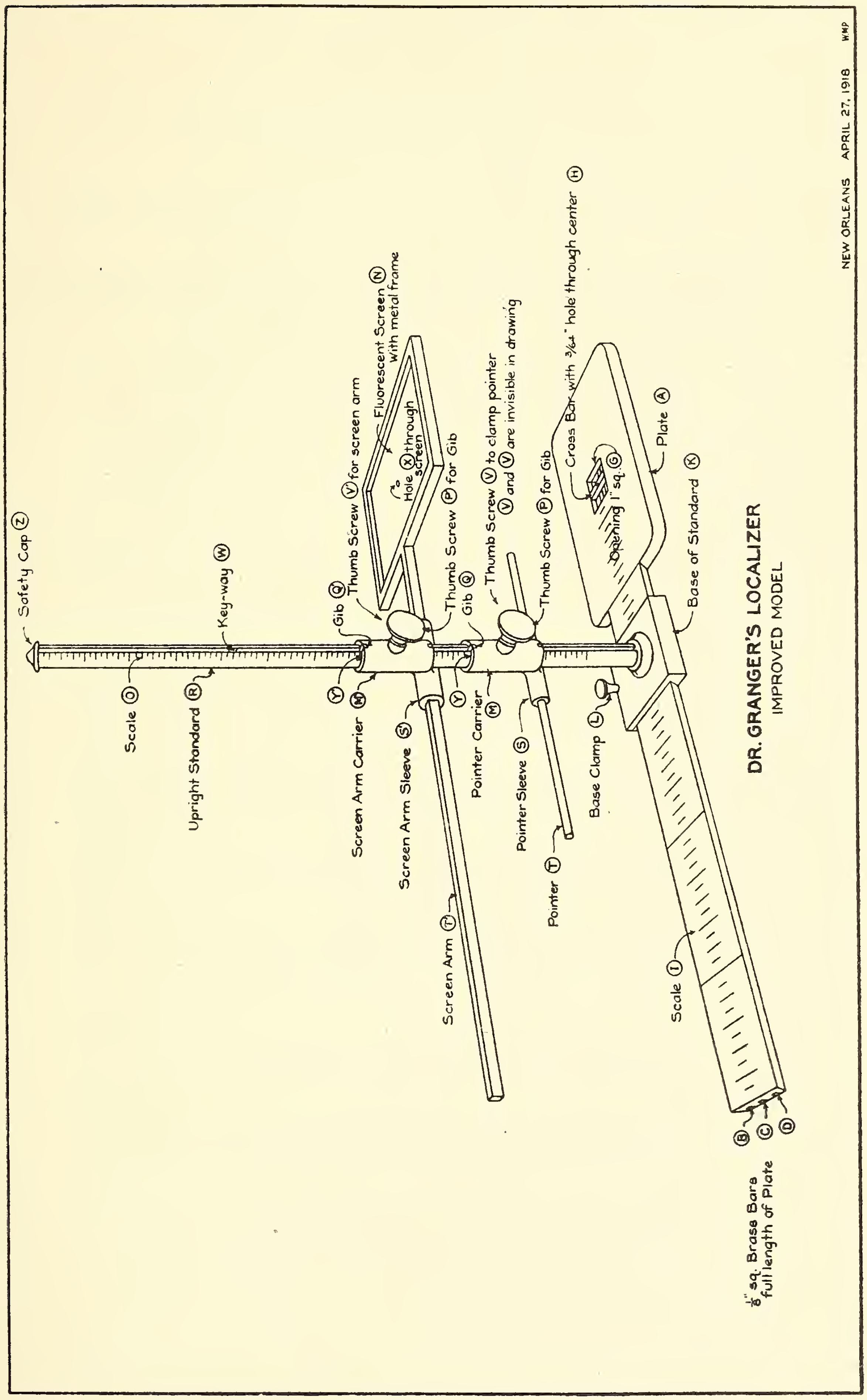
It is advisable to frequently—every time that the tube is removed from the holder, or that the localizer has been subjected to accidental bending, such as may be possible during transportation—check up the accuracy of the centering of the tube and the accuracy of the alignment of the various parts of the localizer by noting whether the shadow of the pointer merges with that of the central guide, that is, whether the centers of their shadows coincide when the centers of the shadows of the foreign body, and of the cross, coincide. (Figs. 4–5.) If the shadows of the pointer and of the central guide do not coincide (Figs. 13–12), a correct localization will still be made, if after shifting the tube as already described the pointer is moved until the relation of its shadow to the lateral guide shadow is exactly the same that it was to the central guide (Figs. 15–13). When the centers of the shadow of the foreign body and of the central guide coincide (Figs. 12–14) the correction is made by moving the pointer so that the position of its shadow with reference to the shadows of the central and of the lateral guides will be identical. This causes it to travel a distance equal to the travel of the foreign body. The essential point to remember is that for the same shifting of the X-ray tube the shadows of the foreign body and of the pointer must travel an equal distance and that this distance is accurately measured by causing their shadows to assume the identical relation to the lateral guides which they had to the central guide before the tube was shifted and before the pointer was moved. If this is remembered and done, the use of the localizer is positively free from error.

This localizer affords a simple, practical and accurate means for using the parallax method of localization. This method depends for its application upon the well established fact that the shadows of two metallic bodies—say, a foreign body and a pointer—seen on a fluorescent screen

will travel an equal distance when the position of the X-ray is shifted only if they lie in the same horizontal plane.

Heretofore it was necessary to watch very closely the travel of the shadows of both the foreign body and of the pointer, while the tube was being shifted and the pointer moved up and down until the observer was certain that these shadows traveled together and an equal distance. This necessitated very careful observation and consumed many minutes, and the possibilities of error were greatly increased when the part in which the foreign body was located happened to be thick and broad, so that the shadow of the foreign body was at some distance—that distance may be as much as twelve inches—away from that of the pointer.

These difficulties are readily overcome by the metal bars running the full length of the base plate (the distinctive feature of this localizer). The shadows that these bars cast on the fluorescent screen can be seen by the observer whether the screen lies over the square opening in the base plate or over any other portion of it, and by their aid the travel of the shadows of the foreign body and of the pointer caused by the same shifting of the X-ray tube is made rapidly, accurately and independently.



DR. GRANGER'S LOCALIZER
IMPROVED MODEL

Screen Images of Bullet Before and After Localizer is Placed in Position

FIG. 2 — BEFORE

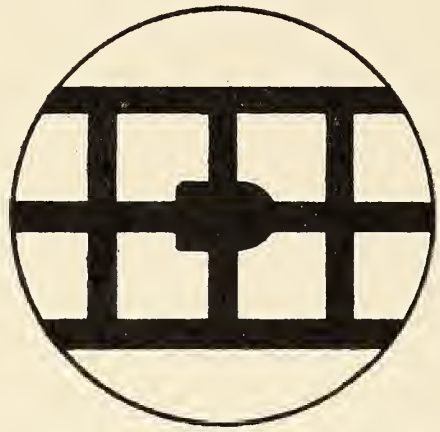


FIG. 3 —AFTER

Screen images showing the correct relation of foreign body and of pointer to the central and lateral guides to secure accurate localization under the following conditions:—

1. When the tube is properly centered and the localizer is accurate.

Before the tube is shifted and the pointer moved.

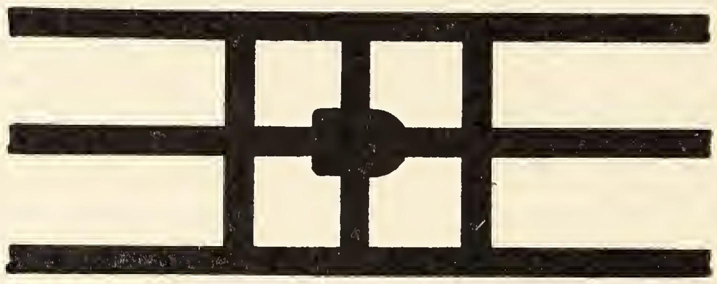


FIG. 4

FIG. 5

After the tube is shifted and the pointer moved.

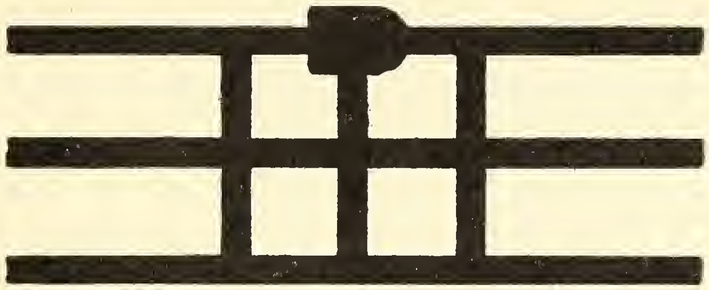


FIG. 6

FIG. 7

2. When the foreign body is very small.

Before the tube is shifted and the pointer moved.

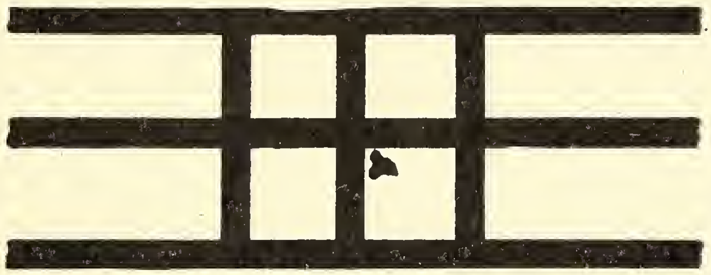


FIG. 8

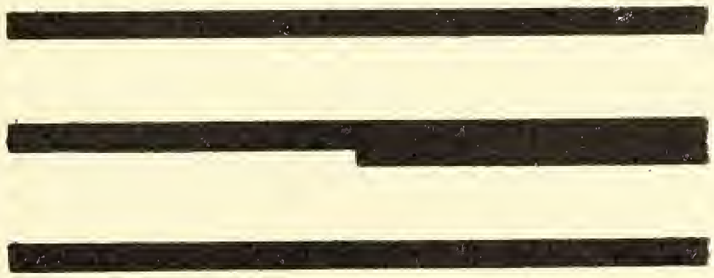


FIG. 9

After the tube is shifted and the pointer moved.

FIG. 10

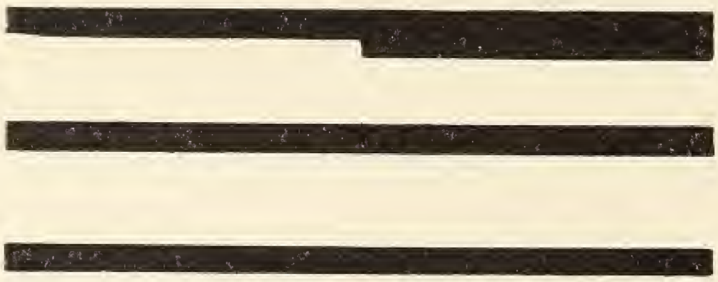


FIG. 11

3. When the parts of the localizer are out of alignment.

Before the tube is shifted and the pointer moved.

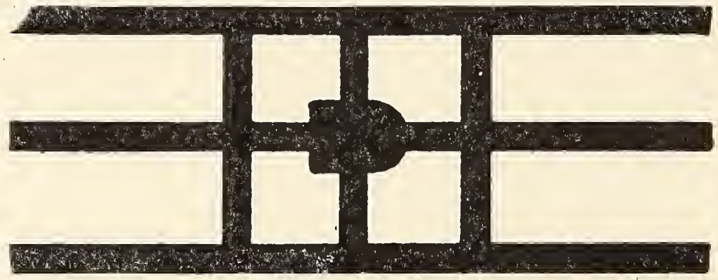


FIG. 12

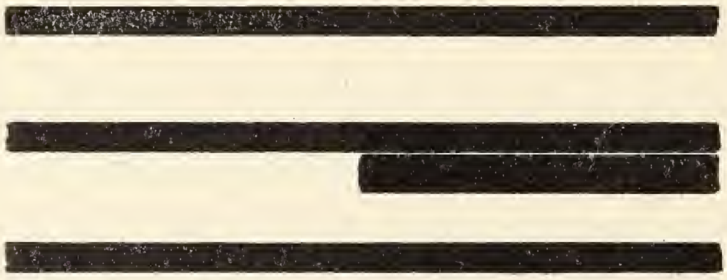


FIG. 13

After the tube is shifted and the pointer moved.

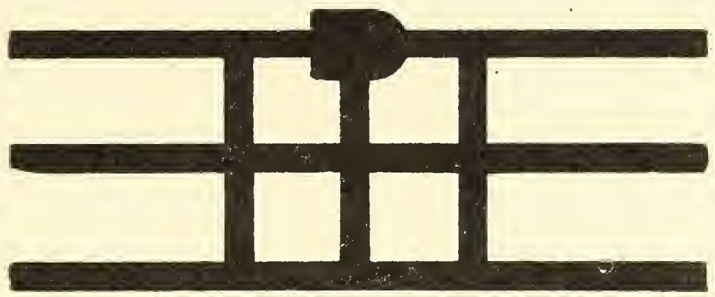


FIG. 14

FIG. 15

PHOTOGRAPHIC PHYSICS AS RELATED TO ROENTGENOLOGY

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The physics of the generation and utilization of X-rays has been presented to Roentgenologists by many capable workers and in various forms. The purpose of this additional contribution to the subject, or rather resumé of a certain phase of it, is to attempt to emphasize certain laws of photographic physics governing the recording of X-rays or Roentgen rays.

When we consider the dependence of almost all various branches of X-ray science, both theoretical and practical, on the performance of the thin coating of silver salt and gelatine in the photographic plate, the study of the physical laws involved in its reaction to X-ray stimuli become important.

The writer described the methods which he has developed for the study of the photographic physics of Roentgenology in a quantitative way in a recent paper.[1] Several of the initial results of the investigation were also outlined in that paper.

There are only a few fundamental laws of physics, however, which need to be understood for one to thoroughly master that phase of Roentgenology. Reduced to basic principles, we have in all our X-ray equipments the same electrical system. There is always some type of high voltage generator, an X-ray tube, a spark gap of volt meter to measure the voltage and a current indicator. The X-rays

[1] *American Journal of Roentgenology*, December, 1917.

produced by all the various equipments are similar and the only change in them, made by variations in individual equipments is to bring in local differences controlling the efficiency of the system. We have in all systems the production of cathode rays in the tube when a high voltage current is allowed to flow through the circuit, and where a cathode ray strikes the target there is always an X-ray pulse produced. We have only to understand the factors influencing the efficient production of a cathode ray and the efficient utilization of the ensuing X-ray pulse to know all that it is necessary to know of the physics of Roentgenology.

There are two primary factors affecting X-ray emission —namely, voltage and current, and three primary factors influencing the utilization of X-rays, namely, distance, absorption and photographic effectiveness. While there are other factors which have secondary influence on the voltage, its statement in terms of actual volts or inches of spark gap is sufficient with modern X-ray generators to rather sharply define the quality of X-rays produced. The current measured in milliamperes gives a ready means of stating the quantity of X-rays produced. The effect of variation of voltage and current under standard conditions on the photographic plate have been studied and it has been found most convenient to express the relation between photographic effect and voltage in the form of a table as follows:

If, for example, the distance, current, and time are kept constant and a certain photographic effect produced under three-inch spark conditions in one second, the ratios of the exposure times necessary to produce the same effect with 2, 4, 5, and 6-inch sparks are

2″	spark	3.0
3″	"	1.0
4″	"	.6
5″	"	.4
6″	"	.3

This table agrees approximately with the voltage square law found by Shearer and others.

From conclusive experiments made in the Research Laboratory it has been found that the photographic effect varies directly with the current, that is, if the current is doubled, the photographic intensity is doubled, so that we may always correctly express the exposure by the formula $E=It$ so that where I is measured in milliamperes and t in seconds, we may get the same equivalent exposure effect whether we use a large value for I and a short time, or a very small value for I and a long time. Such a simple law does not hold good in the case of white light.

Considering the factors influencing the efficient utilization of X-rays:—It is long since a proven fact that the intensity of X-rays varies as the square of distance from the source of their generation. This factor, then, can be found by simple arithmetic. The influence of the other two factors, absorption and photographic effectiveness, can only be found by actual experience. They are, however, more easily standardized than one would think on casual consideration. The absorptions of the various parts of the human body do not vary considerably in average normal persons. Certainly the accuracy with which deviations from the normal may be estimated is sufficient to obtain a correct negative if the other factors mentioned are correctly controlled.

Photographic effectiveness becomes a constant if one particular kind of photographic material is used. Stating these various factors in the form of an equation, we obtain the following formula:

$$\text{Time (in seconds)} = \frac{\text{distance}^2 \text{ (in inches)} \times \text{Spark Factor} \times \text{Absorption Factor}}{\text{K (Constant of plate)} \times \text{current in M. A.}}$$

or

$$t = \frac{D^2 \times S_f \times A_f}{K \times \text{M. A.}}$$

The spark factor is given in the preceding table and the absorption factor for the various parts of the body can be found after a little experience and can be written in the form of a table. For Seed X-ray Plates the constant in the denominator is 30. The distance, spark and milliamperes, of course, can be read directly. This gives us with a simple computation a correct time for exposure under all conditions, regardless of which factors we vary or how we vary them and has proven quite practical in a number of instances. As an example, the following case may be given:

D=20″
Spark= 5″ (therefore S =.4
M. A.=20
Af= 5 (elbow)
K=30

$$t=\frac{20^2\times.4\times5}{30\times20}$$

$=\frac{4}{3}$=about one second and a third

The writer does not offer this formula as a rigid form of technique since the special considerations of each individual case often give considerable influence to the method of procedure. It may be found helpful, however, by some who find difficulty in changing the various factors understandingly.

There are a number of other factors of secondary importance which affect the efficient utilization of X-rays. If we consider X-rays to be merely a wave form of radiation, the same as ordinary light with the only difference being a shorter wave length, then the problem is simpler to grasp. The beam of X-rays coming from the tungsten target of the tube is analogous in quality to the light emitted by incandescent tungsten. The X-ray spectrum of tungsten, in fact, may be compared to a white light spectrum, with the exception that certain wave lengths in narrow regions are intensely bright. The beam coming from the tube is usually

called the primary beam. The wave lengths of the X-rays composing it are governed by the material of the target and the voltage through the tube. The general type of the spectrum is entirely dependent on the material of the target. The position of the bright lines above referred to being characteristic of the atoms in the material of the target. Thus, the position of these bright lines in the spectrum from the tungsten target tube are always the same, regardless of the type of tube or the method of generation of the power. It is an inherent quality of tungsten. Similarly Molybdenum, Platinum and other metals show their characteristic wave lengths.

It is with this primary beam that most of the processes of Roentgenology are concerned and were it possible to have the entire beam strike the photographic plate with no absorbing medium, there would be no changes in its course or composition. It is, however, a further disturbing fact that the energy of the primary beam of X-rays may under certain circumstances be changed either in direction of application or quality. Such a change is usually referred to as secondary radiation and is of two types, scattered radiation and characteristic radiation. Scattered radiation is merely a scattering of the primary beam of X-rays by the atoms composing the substance which is being rayed. This scattering is quite similar to the scattering of a beam of white light by ground glass or other diffusing media. The quality of the scattered rays is practically the same as that of the original beam, so that they are photographically quite as active. In radiography of the thicker parts this phenomenon causes considerable trouble as the effect in a radiograph is to blur fine detail. This effect may be minimized by the use of diaphragms which limit the cone of operation of rays in the body.

As mentioned previously every element has its own particular X-ray spectrum or characteristic wave length emission. Now this spectrum may be generated by cathode

rays or by other X-rays striking the element question. The condition for the generation by other X-rays is merely that the stimulating rays must be of shorter wave length than the characteristic rays of the elements when used as a target. It is merely a type of fluorescent radiation. Characteristic radiation is of no great consequence in modern radiography, for care is generally exercised that the metals whose characteristic radiation is dangerous are kept outside the range of the primary beam. The characteristic radiation of Aluminum, which is used largely in such appliances, fortunately is absorbed by the paper or containers of the photographic plate.

We have a similar phenomenon of fluorescence taking place in our intensifying screens. In this case, the greater part of the energy of the incident X-rays passes through the photographic material, is absorbed by the crystals of calcium tungstate in the screen and is reëmitted as ordinary light which is returned to the photographic plate, intensifying the action of the original X-rays. It must be borne in mind that such fluorescent light obeys all the laws governing photography by ordinary light and that such materials which absorb ultra violet and the visible colors of the spectrum will also absorb this fluorescence. Therefore, specks of dirt, developer stain, and other absorbing media will cause spots in the resulting negative.

In conclusion, a brief summary of the present trend of theoretical X-ray physics, which has been made possible by photographic methods, may be of interest. We are able at the present time, by means of the X-ray crystal spectrograph, to obtain an analysis of the spectrum of an X-ray beam with almost as great simplicity as we can analyze ordinary light in our usual spectrograph, and reversing the system and using a known wave length of X-rays, we can study the internal constants of a particular crystal with almost as much certainty as we can measure the external dimensions. As a result of these studies, we are amassing

much significant data in regard to the exact nature of X-rays and their generation. The most brilliant part of this work has been done by the Braggs, DeBroglie, Hull, Dersham and others. Dersham[2] has recently designed a method by which X-rays can be focussed. It is merely an adaptation of the crystal spectrometer. While such an apparatus at present is merely of theoretical interest, it is interesting in view of the fact that it is the first occasion on which X-rays have been known to be intentionally focussed.

The progress of the science of X-rays has been phenomenal, since the announcement of the discovery by Roentgen in 1895, and the subject is still in its infancy. With the interesting possibilities presented by the results of current medical and physical investigations, there seems to be great promise of revolutionary improvements in the science of Roentgenology in the near future.

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[2] *The Physical Review,* March, 1918.

STANDARDIZATION OF ROENTGENOGRAPHING THE SHOULDER AND HIP JOINT

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Gentlemen of the Western Roentgen Society:—

It is with considerable diffidence that I appear before you, as I have no expert knowledge of the science of Roentgenography. When I think of the work of my personal friend, Dr. Eugene Caldwell of New York City but formerly of the great west, Kansas, has done, my respect for Radiography is great. Therefore in presenting this paper, I fear that it may cause amusement to you Roentgenologists.

It was suggested that I take up the consideration of the major joints but as that is too big a field for one paper, I have decided to confine myself to the shoulder and hip-joints for comparison and standardization.

Let us first, as briefly as possible consider the anatomy of these two joints.

The shoulder joint, as we know, is a ball and socket joint in which the articular head of the humerus is enormous as compared with the fossa of reception on the scapula or glenoid fossa.

Interestingly enough, the axis through the head, neck and greater tuberosity is that of the child at birth—that is, it looks forward and outward in the plane vertical to the plane of the glenoid fossa.

This is because the scapula is applied to the postero-lateral quadrant of the thorax and the glenoid plane therefore projects forward and outward.

In the anatomical position, arm vertically placed, palm forward, the above direction is obtained. If we can project a shadowgraph at right angles to this plane, we will most nearly get a silhouette with no overlapping of parts. If an antero-posterior plane is taken the humerus shadow overlaps that of the parts. A simple instrument as per diagrams 1 and 2 can be applied to the tip of the coracoid process in front and the posterior angle of the acromion process posteriorly. A pointer attached to the part applied to the tip of the coracoid will indicate this plane; the X-ray apparatus can then be adjusted to take the picture.

If we refer to diagrams (3) and (4), we can readily see what I mean. Necessarily the shadow of the tip of the coracoid process will overlap in front and the acromial process shadow behind, but the articulation between the head of the humerus and glenoid cavity is in this plane. Having obtained the plane tangent to the humerus and the glenoid cavity, we can rotate the marker downward from the tip of the coracoid process till it is at right angles to the long axis of the cavity, the posterior angle of the acromion process being the centre of rotation. We then have the rays running as nearly across the glenoid fossa as possible, rather than obliquely and through its centre. To obtain the longitudinal axis of the glenoid fossa, a line from the antero-external angle of the acromial process to the axillary border of the scapula will about pass through the longitudinal axis of the fossa. Practically, if the pointer is placed about ½ inch below the tip of the coracoid process, the result is obtained.

Lastly, by having the pointer placed on a bar as per diagram, ¾ of an inch medial, the central rays will pass through the articulation tangentally as the coracoid process overlaps the glenoid fossa approximately that distance. This will give a standard skiagraph and any departure will indicate something wrong with the anatomy.

I don't know as it would be of value to Roentgenologists

to endeavor to take a Roentgenogram with the rays directed fully on the glenoid fossa.

As I have pointed out we can very closely determine the direction of the glenoid fossa.

We know that the antero-external angle of the acromial process reaches to the long axis of the glenoid fossa. The glenoid fossa is a part of the lower ¾ of the scapula, therefore as we can easily get the lower angle of the scapula, we obtain the axis. The line connecting the tip of the coracoid process passes through approximately the centre of a circle whose radii reach to the coracoid process, acromial process, and lower lip of the glenoid fossa.

The hip joint is interesting from the view of functional position.

At birth the head, neck and greater trochanter are in the same axis, that is, the acetabulum looks downward, forwards and outwards, and the axis of the head and neck of the femur does the same. But with the assumption of the erect position the femur is in extreme extension and extreme external rotation.

An antero-posterior radiograph therefore superimposes the shadows. We also have a partial view of the acetabulum.

If we can devise some way of taking a skiagraph tangent to the acetabular lips similar to that for shoulder joint we can obtain some standard picture from which to study departures. This is easily done by remembering that the plane of the acetabulum is nearly parallel to the plane formed by the Poupart plane and the tuberosity of the ischium. By devising an instrument of which I have a rough model this can be easily accomplished. (Fig. V.)

In the diagram the pointer is pointing downward from the mid-Poupart position and at right angles to the Poupart plane. It just touches the two lips of the acetabulum provided it is placed about ¾ of an inch external to rod joining the anterior superior spine and the spine of the os

pubis. Reversing the pointer, it tells the operator where to place his tube to direct his rays.

Bearing in mind that the head of the femur deeply engages the acetabulum and is externally rotated so that the articular surface of the femur in front is well out of the cavity and that the posterior lip of acetabulum and head of the femur are in the same line, we have, I believe, a standard for variations. By experimenting with some bony skeletons, a ligabenous skeleton and by radiograms, I find that by flexing the limb and internally rotating as well as adducting the same so that the toe rests in the heel of the other leg, the axis of the head and neck and greater trochanter take the same direction as the downward, forward and outwaid axis of the acetabulum. We therefore have the bones of the hip-joint in position for a profile picture.

One can approximate the acetabulum by the following method. The vertical plane through the mid-Poupart point is tangent to the inner line of the acetabulum as well as the outer limit of the brim of the pelvis. The obturator crest which starts at the spine of the pubis and ends in the upper limit of the cotyloid notch of the acetabulum, if continued horizontally outward, practically bisects the acetabulum. The distance from the vertical plane at the mid-Poupart point to the point of intersection of the obturator crest continuation and the vertical plane to Poupart line at its middle, gives us the radius of the acetabulum brim. I don't know as this has much to do with this subject, excepting it is always comforting to me to approximate the actual position of things in the living specimen.

Fig. 1

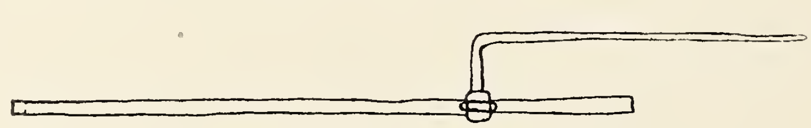


Fig. 1. Top view of pointer.

Fig II

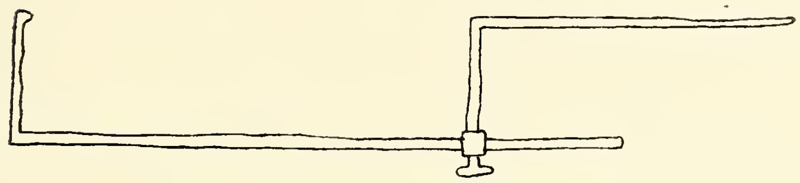


FIG. 2. Lateral view of pointer.

Fig III

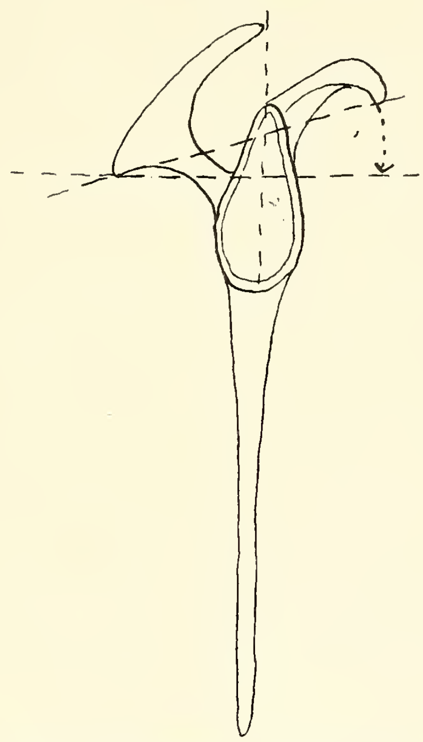


FIG. 3. View of Scapula to show diameters.

Fig IV

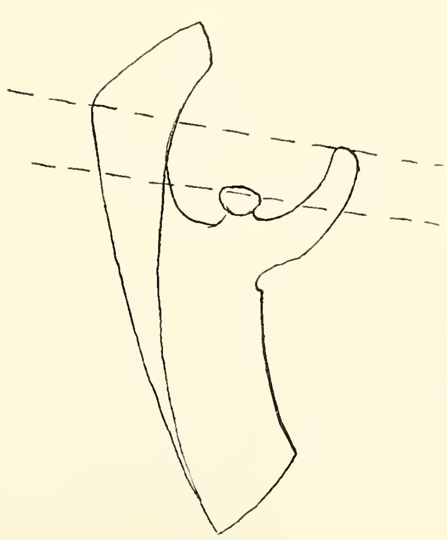


FIG. 4. View of Scapula from above to show plane of glenoid fossa to plane from Tip of Coraivir and posterior angle of Ceronium.

Fig. V

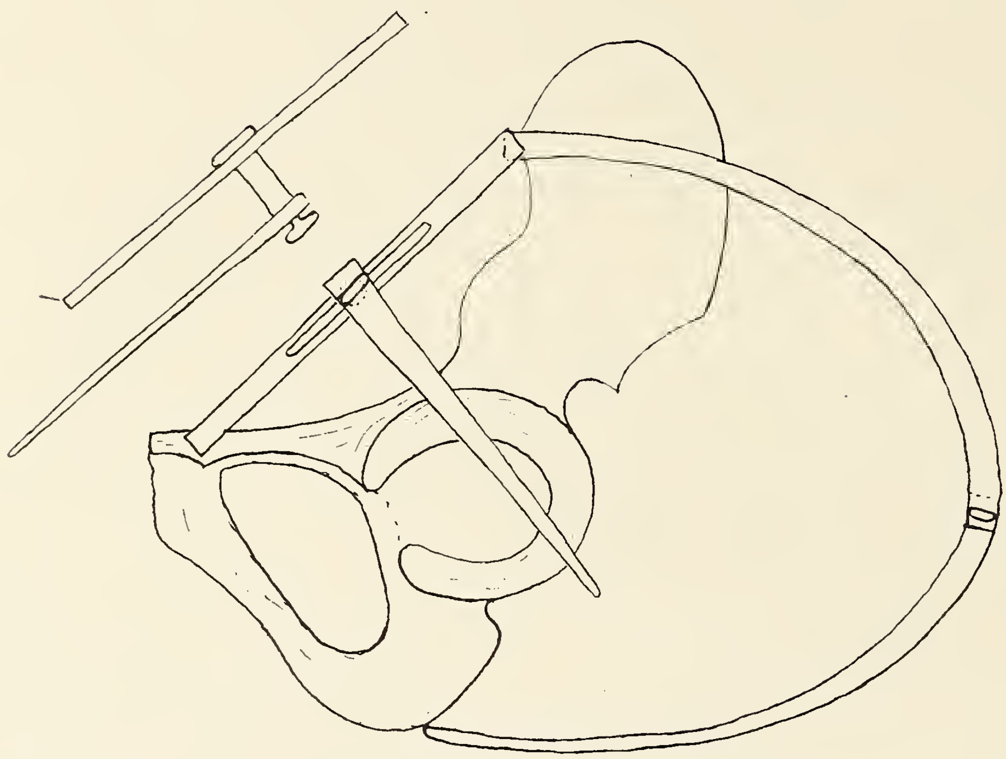


Fig. 5. Instrument to determine plane of Acetabulum.

SARCOMA RESPONDING TO ROENTGEN THERAPY CASE REPORT

By Bundy Allen, M. D., Iowa City, Iowa.
Roentgenologist, University Hospital, State University of Iowa, College of Medicine.

The variations produced in the Roentgenograms by Neoplasm of bone vary with the type of lesion present. Sarcoma is the most frequent malignant growth and is best considered under the two broad divisions, central and peripheral. The peripheral type or variety shows irregular shadows of the thickened structure which is incomplete ossification radiating frequently from the center of the growth. In central rapidly growing sarcoma as the round or spindle cell type, the tumefaction shows a more or less complete disappearance of the bone tissue, as though it had been eaten away, or as in the advanced case the bone may have the appearance of a shell, and be liable to spontaneous fracture. It appears that a certain number of bone tumors which thought to be sarcoma from clinical and Roentgenographical characteristics have on operative incisions discharged such a characteristic pus as to cause the operator to desist with a change of diagnosis to osteomyelitis. Subsequent progress of these cases and in some instances histological examination have shown them to be true sarcoma complicated by the presence of sterile pus. The following case report is one of the above type.

Patient a High School girl of twenty. Was referred to the Roentgen Department of the S. U. I. Hospital by the Surgical Department of the Homeopathic Hospital for Roentgen examination of the left shoulder with the diag-

nosis of tuberculous bursitis. She first complained of pain in the left shoulder in December 1915. In three weeks pain disappeared to recur again about March 1, 1916. Since which time it gradually grew worse. Pain was referred to the insertion of the coraco-brachialis and biceps tendons and was made worse by movements of the elbow jont. There was no history of a fall or blow; no redness. Swelling was first noticed about April 2nd, 1916. Personal and family history was negative. General physical examination negative. Blood and urine findings negative. No myelocytes were found in blood. The left shoulder presented a firm, non-movable enlargement in the deltoid region with some fluctuation apparent beneath the coraco-brachialis and biceps muscle. There was some wasting of the scapular muscles. Some small nodules could be felt in the outer wall of the axilla. The motion at the shoulder was markedly restricted. The hand on the affected side was colder than its fellow.

Roentgen examination April 4th, 1916 shows a typical plate of a sarcoma involving the middle and upper thirds of the shaft of the humerus (Fig. 1.) Roentgen diagnosis of sarcoma disregarded by surgeon.

April 15, 1916, affected area was aspirated and five cc's of bloody serum obtained and found negative for tubercular bacilli. April 22, 1916, patient was operated upon, an incision being made thru the deltoid bursa. The site was curetted and drainage installed. Pathological report was round cell sarcoma. May 20, 1916, patient was referred to the Roentgen Department of the S. U. I. Hospital for further Roentgen observation (Fig. 2). Roentgen Therapy advised. Patient was given deep therapy intensively, using the cross-fire method.

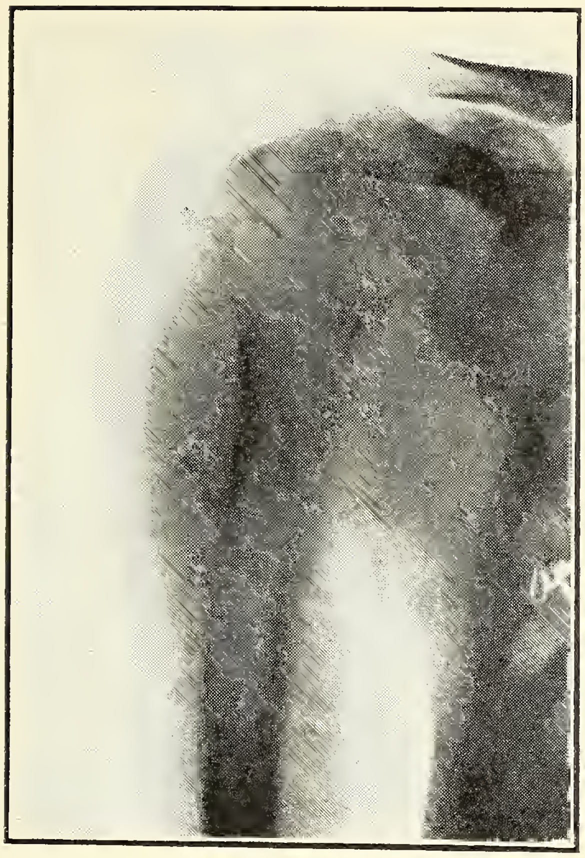


Fig. 1, April 4, 1916. Plate shows typical sarcoma with the characteristic involvement of the shaft, the periosteum being elevated and a slight swelling of the soft tissue.

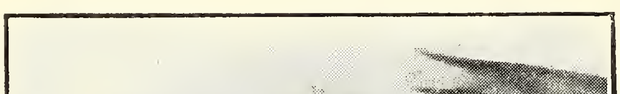


Fig. 2, May 20, 1916. Plate shows involvement of 46 days duration slightly increased.

Fig. 3, May 24, 1916. Note rapid pathological change in short duration of time with a marked deformity of the bone.

Fig. 4, May 27, 1916. Pathological changes rapidly progressing.

Fig. 5, May 31, 1916. Plate shows pathological fracture.

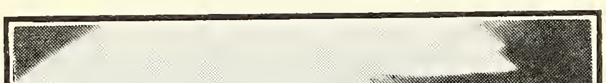


Fig. 6, June 3, 1916. Plate shows reduction of the swelling of the soft tissue following deep roentgen therapy.

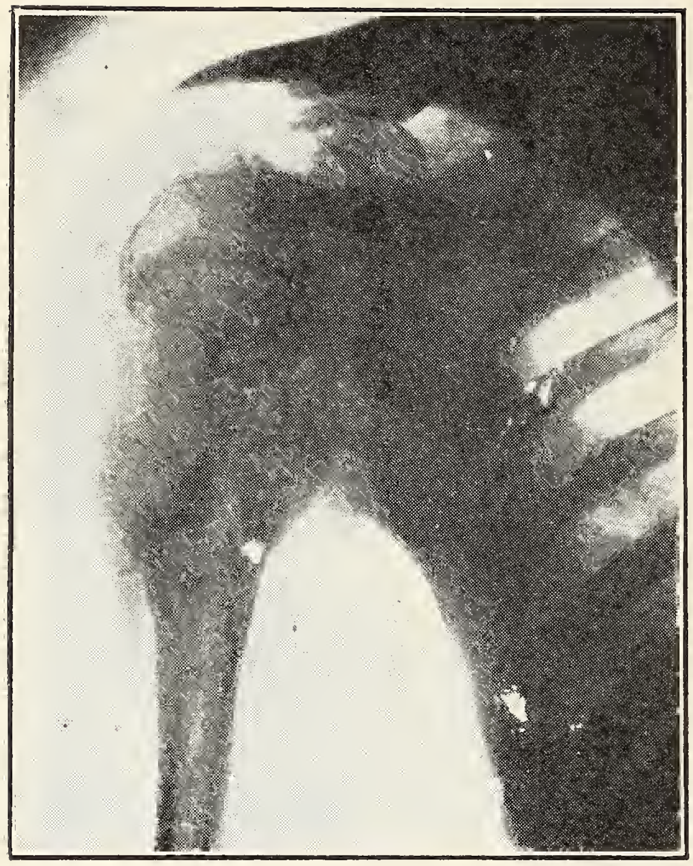


Fig. 7, June 21, 1916. Size of shoulder practically normal. Bone deformity increased but the plate shows marked improvement by way of new bone tissue.

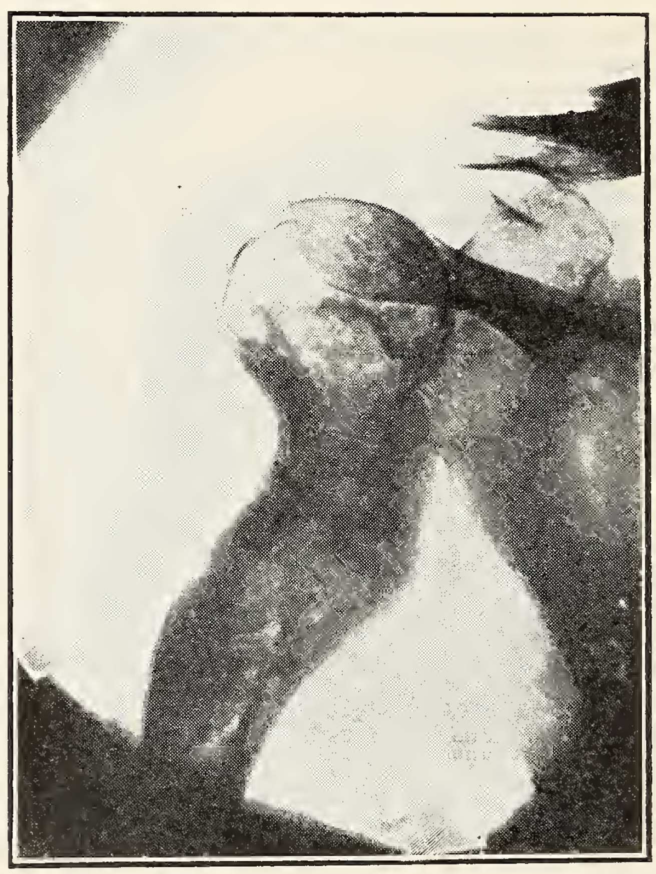


Fig. 8, Sept. 2, 1916. Size and contour of shoulder normal. Destroyed area of bone practically replaced. Patient could only carry the arm extended straight down from the shoulder which accounts for the straightening of the deformity.

Fig. 9, Nov. 6, 1916. Plate shows shoulder and humerus restored to normal.

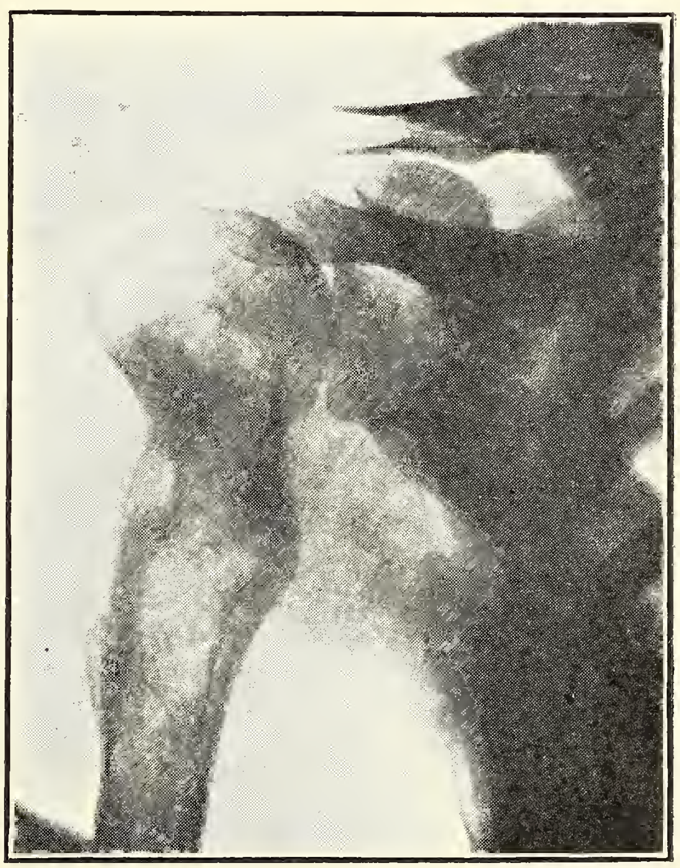


Fig. 10, Nov. 6, 1916. Same as Fig. 9 showing no change.

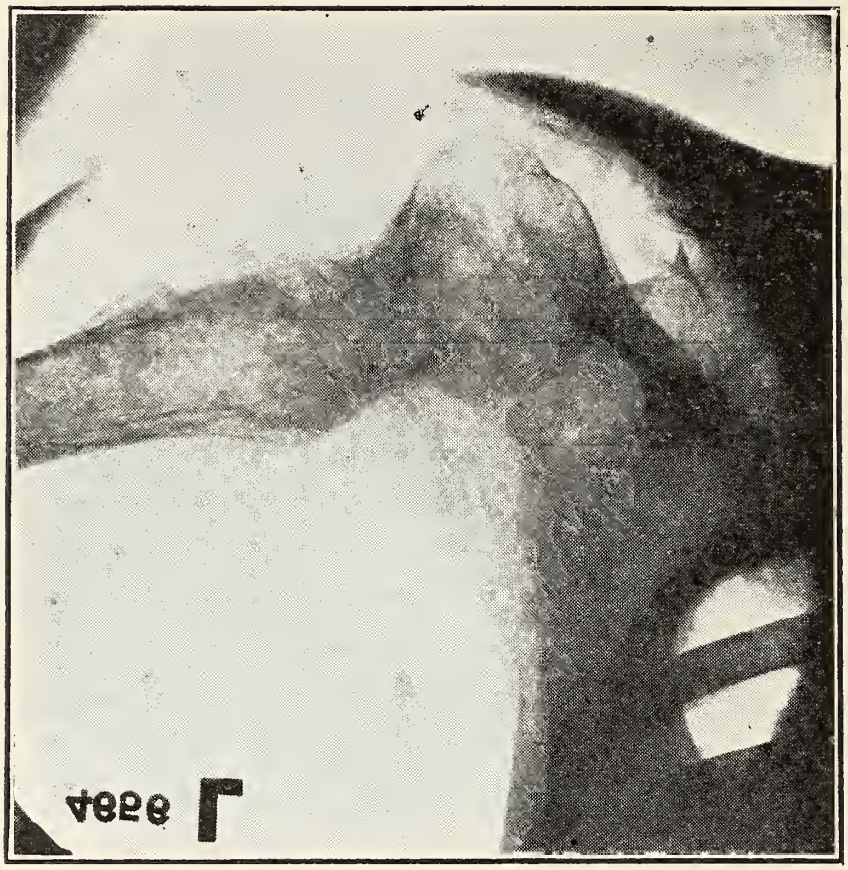


Fig. 11, Nov. 29, 1916. Showing arm extended. Function practically normal.

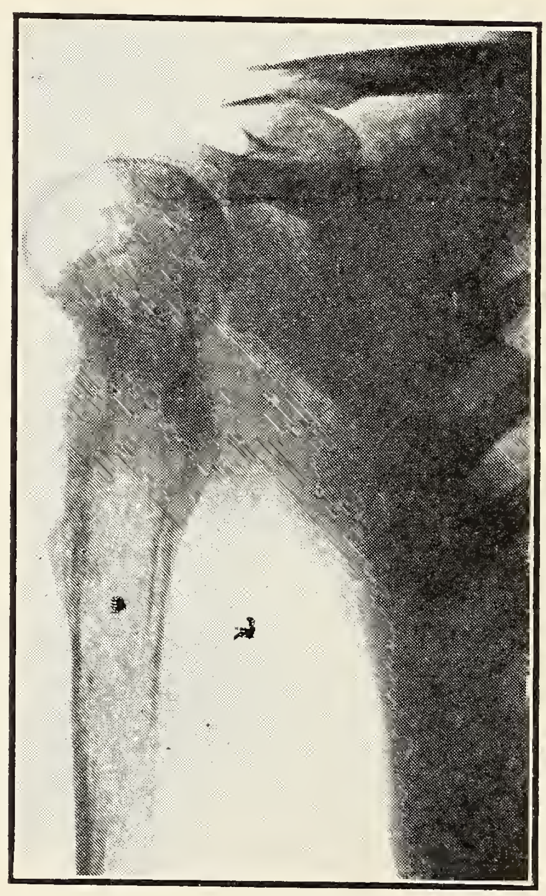


Fig. 12-13-14. Dated Dec. 1, 5, and 15th respectively show a normal consistency of the shoulder and humerus. Function also practically normal.

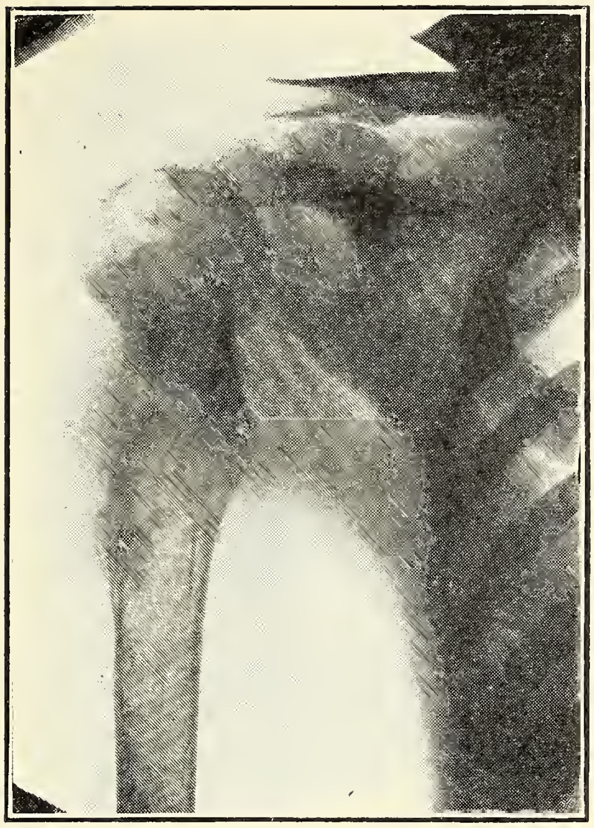


Fig. 13

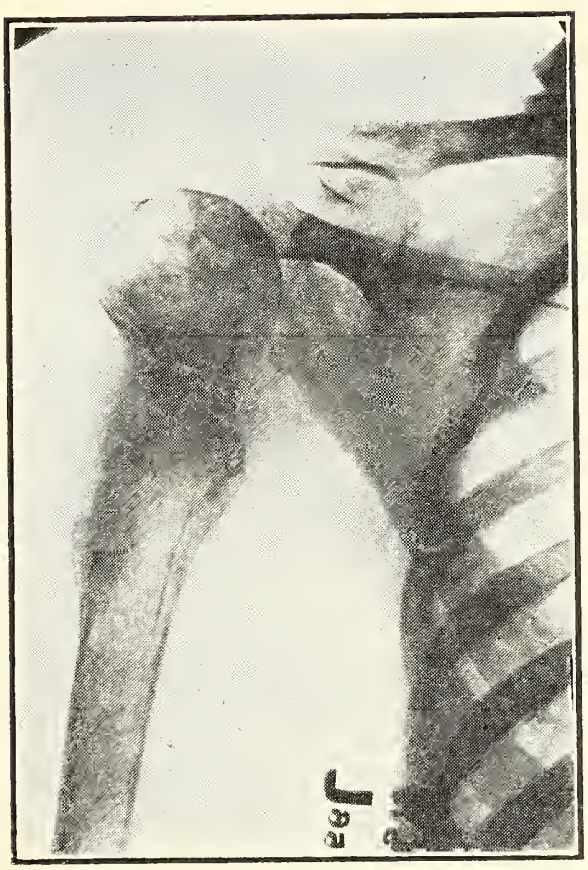


Fig. 14

Patient practically free from symptoms of the shoulder or arm up to March 15, 1917. About the above date patient complained of severe headaches accompanied by marked defective vision. Within three weeks patient suffered total loss of vision followed by severe headaches which could not be controlled by the administration of opiates. Patient continued to suffer with severe pains in the head and a rapid loss of weight and died May 26, 1917, with metastisis of the brain.

ARTIFICIAL PNEUMOTHORAX

J. B. Crouch, M. D., and J. F. Wallace, M. D.
Woodmen, Col.

James Carson, an English physiologist in 1821, while experimenting on the elasticity of the lungs, inflated the pleural sacks of animals and foretold the value of artificial pneumothorax. However, he never tried this treatment on man. In 1892, after noting the improvement of several cases after developing spontaneous pneumothorax, Carlo Forlanini, an Italian physician, suggested this method of treatment. After years of experimentation he made his first report of its use in man, in 1895.

In 1898, Dr. J. B. Murphy, working independently of Dr. Forlanini, made his first report on five cases. The first great notable improvement in this method of treatment was made by C. Langman, of Christiana, who introduced the water manometer for determination of intra-pleural pressure, which renders the procedure comparatively safe.

I would consider the application of the Roentgen ray the next great improvement, for by its use the exact extent of the disease in both lungs can be determined before instituting treatment, and the degree of compression determined when treatment is established.

As you all know, the indications for the induction of artificial pneumothorax are unilateral disease, which fails to respond to rest treatment; rapidly progressing unilateral trouble of hemoptysis, where the side from which the bleeding occurs can be determined. I will now consider the technique of this operation.

The slides which we are going to show were all taken by

Dr. J. F. Wallace, at the Roentgenological laboratory of the Modern Woodmen of America Sanatorium for Tuberculosis. These slides show the condition of the lungs before the air was introduced and after the collapse was completed. 2635 (A. B.) Entered the sanatorium April 21, 1916. Physical examination showed far advanced trouble on left (T. G. 3) and early trouble (T. G. 1) on right. Also tuberculous laryngitis. No hemorrage, patient septic. Patient continued septic. On June 8, 1916, pneumothorax treatment was given. Received 500cc of air on this date. He was given eleven treatments while at the sanatorium, the largest amount of air injected being 1100cc, the smallest 500cc and the average amount 966cc. Patient made a marked improvement and was discharged from the sanatorium October 19, 1916. At the time of his discharge sputum was negative for tublercle bacilli. Last report this patient was still living, in good health, and taking pneumothorax treatments in Chicago.

3048 (ESS) Entered the sanatorium Jan. 17, 1917, physical examination at this time showed R. III, L. I. He had a history of repeated hemorrhages. He also had a well marked diabetes. This patient had repeated hemorrhages, beginning Feb. 12, 1917; artificial pneumothorax was begun Feb. 17, 1917, at which time 800cc were given. He was discharged from the sanatorium August 25, 1917, and he returned to his home in Kansas. However, he is still taking pneumothorax treatment at the sanatorium, coming every six or eight weeks to receive his injections of air. He was put upon the Allen treatment for diabetes soon after his admission, and with careful diet has remained sugar free since that time. At present his health is excellent, and he is working on his farm in Kansas. The largest amount of air injected was 1400cc, the smallest amount 550cc, with an average amount of 859cc. Effusion has been present in his case since June, 1917.

Case 2701, (RMcC) Entered the sanatorium June 1, 1916,

physical examination showed far advanced trouble (T. G. 3) on right and early trouble (T. G. 1) on left. Patient was septic. Because of no improvement under rest treatment was given artificial pneumothorax on August 10, 1916. He was given twelve treatments at the sanatorium. The largest amount of air given being 1700cc, the smallest 500cc with an average amount of 1333cc. Patient had a severe emphysema and never developed fluid. Was discharged from the sanatorium Feb. 2, 1917, and returned to Oklahoma, where he continued to take treatment. Was in fair health on last report.

2942 (JLW) Entered the sanatorium Oct. 28, 1916, classified on physical examination as Left I, Right II. Paient became worse during the first month and pneumothorax was begun Nov. 15, 1916. Made a well marked improvement He was discharged from the sanatorium August 3, 1917, but remained in Colorado Springs and has since continued to take pneumothorax treatments. He had taken thirty injections of air in all, the largest amount being 1100cc and the smallest 150cc, with an average of 404cc. Effusion has been present since March 7, 1917. Present condition is only fair.

2964 (WFG) Entered the sanatorium Nov. 11, 1916, physical examination showed Right III Left II, with prognosis unfavorable. Patient continued septic in spite of absolute rest in bed. Pneumothorax was begun Jan. 17, 1917, at which time 500cc of air was given. Patient took thirteen injections, the largest amount being 1100cc, the smallest 350cc, with an average dose of 750cc. The patient made a good improvement, the lung which was not collapsed also improved. Effusion was present from May, 1917, to July, 1917, at which time the fluid was absorbed. He left the sanatorium August 25, 1917. Patient was in fair health and taking treatment at Freeport, Ill., at last reports.

2982 (CK) Entered the sanatorium Nov. 22, 1916; physical examination showed Right II Left I; also had a tuber-

culous laryngitis. Patient's condition was fairly satisfactory until December 20, 1916, when he had hemorrhage of three ounces. Dec. 21, 1916, had several severe hemorrhages amounting to fourteen ounces in all. On this date pneumothorax was begun and 1100c of air was given. Two days later 1200cc were given. Sputum remained blood tinged for several days, but he had no more active hemorrhages. However, septic pneumonia developed and the patient remained very ill for several days. Patient remained at sanatorium until June 14, 1917, when he moved to Colorado Springs. He has taken twenty-three injections in all, the largest amount being 1200cc, the smallest 500cc, with an average of 646cc. This patient is in excellent health, owns a grocery in Colorado Springs, and works every day. Effusion has been present in his case off and on since Feb. 25, 1917.

2986 (ARE) Entered the sanatorium November 24, 1916. Was classified on physical examination as R. II, L.I. In spite of only moderate involvement in the lung the patient was very septic and continued to run high fever with a rapid pulse for the first few weeks. Dec. 14, 1916, artificial pneumothorax was begun, at which time 600cc of air were injected. Patient remained at the sanatorium until August 30, 1917, when he removed to Denver. He is still taking pneumothorax treatment at the sanatorium. He has had twenty injections in all, the largest amount being 1200cc, the smallest 200cc, with an average of 500cc. At present he is working as a barber in Denver and his health is excellent. He has had fluid off and on from April, 1917 to Jan. 1918. Has had no fluid since January, 1918. Sputum free from bacilli since May 15, 1917.

3074 (WBM) Admitted to the sanatorium Feb. 10, 1917, when physical examination showed L. III, R. I. Had a complicating larnygitis, also well marked nephritis. Patient was very septic and pneumothorax was begun soon after his admission, at which time 600cc of air was induced. On

March 24, 1917, 900cc was induced, following this injection the patient became very ill, and fluid developed rapidly. The fluid was aspirated several times and the treatment continued. The patient became much improved in health. He was discharged from the sanatorium on November 9, 1917, in fairly good condition. He moved to Colorado Springs, and continued to take treatment till March 27, 1918. He received twenty-two injections in all; the largest amount being 900cc, the smallest 150cc, with an average of 380cc. At the time of his last injection the patient was in very poor condition. There was a small amount of albumen in urine, marked odema of the extremities, dysponea and circulatory embarrassment. He grew rapidly worse, and died April 10. 1918. Sputum was negative for tubercle bacilli, Feb. 10, 1917.

Case 3101 (IND) Entered sanatorium Feb. 29, 1916. Physical examination showed L. III, R. I, with tuberculous laryngitis complicating. Prognosis unfavorable. Patient remained very septic during the first month at sanatorium. Pneumothorax was begun March 21, 1917, at which time 500cc were induced. Patient commenced to improve almost immediately. He remained at the sanatorium until November 30, 1917, fourteen treatments were given in all; the largest amount injected was 1000cc, the smallest 300cc, and an average amount of 702cc. Patient left the sanatorium in good condition and returned to Pennsylvania, where he is still taking pneumothorax. He reported his health, however, as only fair. Patient was free from tubercle bacilli since Sept. 1917.

Case 3218 (JWM) Entered the sanatorium May 21, 1917, physical examination R. III, L. I, also tuberculous paryngitis. Had a history of repeated hemorrhages. Had been treated for nine months by the rest treatment, in other sanatoria, without making any improvement. Pneumothorax was begun May 30, 1917, at which time 300cc of air were introduced. We were never able to obtain a complete col-

lapse in this case because of adhesions around the cavity in the apex. Largest amount of air in twenty-four treatments was 700cc, the smallest amount 100cc, with an average amountof 372cc. Has had effusion off and on since July, 1917. Was discharged from sanatorium Feb. 24, 1918, only slightly improved in health. He is at present in Colorado Springs, and is still taking treatments at the sanatorium. His health is only fair.

Case 3241 (FJ). Entered the sanatorium June 2, 1917. Physical examination L. III, R. I, patient was septic and made no improvement under rest treatment. Pneumothorax begun August 29, 1917, when 500cc of air were introduced. The patient began to improve with the first treatment, and was soon able to be up and to go to the dining room to his meals. Seventeen treatments were given in this case, the largest amount injected being 1000cc, the smallest 400cc, with an average of 632cc. The collapse of the lung was never completed in his case on account of adhesions, but the improvement was very good, in spite of only a partial collapse. Was discharged from the sanatorium May 23, 1918, in good physical condition. Is continuing his treatment in Chicago.

Case 3257 (FPV) Entered the sanatorium June 11, 1917, physical examination L. II, R. I. General physical condition fairly good. July 4, 1917 had a small hemorrhage, and repeated hemorrhages on July 5, 6, 8, and 11, on which date artifical pneumothorax was commenced. 700cc were given on this date. After which there were no more hemorrhages. Patient left the sanatorium on October 31, 1917. Eight injections were given, the largest amount of air injected was 1150cc, the smallest amount 700cc, with an average amount of 962cc. Patient's health was very good when he left the sanatorium. Am unable to state whether he is continuing treatment or not.

Case 3324 (HW) Entered the sanatorium July 3, 1917, physical examination R. II, L. I, also tuberculous laryngitis. Was having a hemorrhage when he was admitted to the san-

atorium. His general physical condition was fairly good. Patient continued to hemorrhage off and on until Dec. 15, 1917, at which time pneumothorax treatment was begun. After this he had no more bleeding. He was discharged from the sanatorium March 22, 1918. He received twelve injections in all, the largest amount of air induced was 1000cc, the smallest amount 500cc, and the average amount 866cc. At the time of his discharge his physical condition was very good, his sputum was negative. He returned to Chicago, where he is continuing pneumothorax treatment.

Case 3383 (JAC) Entered the sanatorium August 20, 1917, physical examination R. I, L. II, tuberculous paryngitis. Patient septic. Artificial pneumothorax begun Aug. 29, 1917; at which time 400cc were introduced. He received ten treatments in all, 900cc being the largest amount given, 400cc the smallest and an average amount of 600cc. He was discharged Dec. 10, 1917, only slightly improved. His health at the present time is poor. He is not continuing treatment.

Case 3392 (JWL) Entered the sanatorium August 24, 1917, physical examination L. II, R. I, patient's general condition was good at the time of admission. Had a moderate hemorrhage September 4, 1917, which had entirely cleared up on Sept. 8th. Oct. 6th developed pleurisy with effusion on the left side. October 10th, 900cc of clear fluid was aspirated and 700cc of air were introduced. The fluid was aspirated twice following this, and following each aspiration air was introduced. After fluid entirely disappeared compression of the lung continued. Seventeen treatments were given, the largest amount of air injected was 800cc, the smallest amount 300cc, with an average amount of 553cc. Patient was discharged May 22, 1918, in very good physical condition. At this time he had no cough or no expectoration.

Case 3451 (GTD) Entered the sanatorium Sept. 18, 1917, physical examination at this time showed R. II, L. I. He

made no improvement under rest treatment until April 17, 1918, at which time pneumothorax was begun. He is still at the sanatorium under treatment. Has had six injections of air, the largest amount being 1000cc, the smallest 330cc, with an average amount of 625cc. He is improving at present. Sputum negative since May 1, 1918.

Case 3445 (CCK) Entered the sanatorium Sept. 22, 1917, physical examination R. II, L. I, physical conditon at this time seemed to be fairly good. Had profuse hemorrhage Sept. 26th, 1917; another profuse hemmorhage Sept. 27th, on which date pneumothorax was begun, 600cc being injected. He continued to bleed the following day and 700cc of air was injected. The patient's condition became critical. He gradually improved and was able to be up and around and to go to the dining room for his meals. His physical condition remained fairly good during the winter, however, March 1st in spite of a good compression his hemorrhages recurred, although not as profuse as before. These hemorrhages lasted about a week. Treatment was continued, however, until the patient was discharged from the hospital, May 2, 1918; condition only fair, not being as good as during the winter. He received twenty-one treatments in all, the largest amount being 1100cc, the smallest 300cc, and an average amount of 805cc.

Case 3469 (DAR) Entered the sanatorium Oct. 2, 1917, physical examination R. III, L. I, also had tuberculous laryngitis, patient very septic. Pneumothorax was begun Dec. 19, 1917, 450cc introduced at this time. The treatment was continued until Feb. 27, 1918, ten treatments were given in all, the largest amount being 1200cc, the smallest 450cc, with an average amount of 805cc. The patient died suddenly March 4, 1918, five days after the last treatment. We were unable to obtain an autopsy in this case, the symptoms, however, of the death were of an acute cardiac dilatation. What the pneumothorax had to do with this case we are unable to state.

Case 3487 (WJA) Entered the sanatorium Oct. 15, 1917. Physical examination L. III, R. I. Had a rectal abscess complicating pulmonary trouble. Patient made no improvement with rest in bed, and pneumothorax was begun Dec. 5, 1917, at which time 500cc of air were injected. Patient improved slowly. Discharged from the sanatorium June 6, 1918. He received fourteen injections, the largest amount being 1350cc, the smallest 200cc, with an average of 835cc. Developed effusion Feb. 1918, which remained until his discharge. Is to continue his treatments at Fort Dodge, Ia. Physical improvement very noticeable at the time of his discharge.

Case 3504 (J. H. McN) Entered the sanatorium Oct. 24, 1917, physical examination R. III, L. I, prognosis unfavorable. Remained very septic with rest in bed, till Feb. 23, 1918, when pneumothorax was begun, 300cc of air were induced at this time. So far he has received ten injections of air, the largest amount 900cc, the smallest 100cc, with an average amount of 640cc. He is still a patient at the sanatorium, and made a very marked improvement since beginning pneumothorax treatment and he is now able to be up and about and to go to his meals.

Case 3508 (RL) Entered the sanatorium Oct. 25, 1917. Physical examination R. III, L. II. Remained very septic. Jan. 2, 1918 pneumothorax begun, 350cc of air injected at that time. Nine injections given, the largest amount being 1150cc, the smallest 250cc, an average amount of 722cc. Patient made slight improvement after the first few injections. Treatment was discontinued March, 1918, as the patient was becoming much worse at this time. Was discharged from the sanatorium April 27, 1918, unimproved. Developed effusion March 6, 1918.

Case 3627 (CBR) Entered the sanatorium Feb. 2, 1918, physical examination R. III, L. I. Patient very septic. Pneumothorax begun Feb. 20, 1918, 400cc of air injected at that time. Patient has taken ten injections, the largest

amount 800cc, the smallest 400cc, with an average amount of 665cc. Patient is still at the sanatorium and taking treatment. He is making marked improvement.

Case 3762 (JAR) Admitted as a patient here April 30, 1918, physical examination R. III, L. I, had been treated for seven months at another sanatorium, becoming steadily worse with rest treatment. Pneumothorax begun May 8, when 350cc of air were injected. He had received five injections, the largest amount being 800cc, the smallest amount 350cc, with an average of 540cc. Has made only a slight improvement since taking pneumothorax.

Case 2628 (TW) Entered the sanatorium April 17, 1916, physical examination showed far advanced trouble (T. G. 3) on left, with beginning trouble (T. G. 1) on right. Patient very septic, continued fever and rapid pulse. June 7, 1916, he had severe pain in left side with considerable shock, pulse rapid and feeble, 140 per minute, temperature 104:6. Physical examination showed localized pneumothorax over lower left side. June 9th succession splash showed evidence of fluid and 200cc of greenish yellowish fluid were drawn. June 12th 900cc were drawn. Patient improved somewhat after spontaneous pneumothorax, and it was deemed advisable to keep the lung collapsed. June 6th 300cc of air injected; June 13th 150cc and June 30th 150cc of air injected. Treatment was discontinued because the lung could not be entirely collapsed on account of adhesions. Patient still living and in good health.

Case 3518 (DO'K) Entered sanatorium Oct. 31, 1917. Physical examination R. III, L. I; Nov. 2, 1917, complained of severe pain in the right side. Examination showed complete pneumothorax on this side. His general condition was fairly satisfactory, only a slight amount of shock. Pulse and temperature, however, remained high. Fluid quickly developed and Nov. 7th 400cc were aspirated. Nov. 14, 400cc of air were injected. As it was deemed advisable to continue the collapse of the lung, the other lung remaining

in good condition. The patient has been aspirated eight times, and amounts varying from 1200cc to 400cc have been removed. He has received six injections of air, varying in amount from 700cc to 100cc, with an average amount of 416cc. He is still a patient at the sanatorium and has made considerable improvement considering his critical condition following spontaneous pneumothorax.

In conclusion I wish to state that we consider a thoro Roentgenogram of the lungs invaluable before beginning artificial pneumothorax; that the degree of compression cannot be determined as successfully by physical examination as by the X-ray plate; that the presence of adhesions can be decided by the X-ray, but cannot be detected by physical examination; that the X-ray plate assists in determining the presence of fluid; which frequently complicates this procedure; and that beginning activity or extension of trouble in the good side can be detected earlier by the Roentgenogram than by physical examination. I also wish to thank Dr. J. F. Wallace for his coöperation and assistance with Roentgenograms in my artifical pneumothorax treatments.

Dr. J. F. Wallace, *Woodmen, Colorado:*

I presume you understand these plates were all taken in connection with our work at the Woodmen sanatorium. They were almost all taken in a horizontal position, except where there was a suspicion of fluid, and in these cases we we use the vertical position. I do not know of any vertical apparatus being invented that will get the patient as close to the machine and give as good a position as lying down, but after artificial pneumothorax is induced we take the horizontal position unless there is a suspicion of fluid, when, as I said before, we take a vertical position. You know that it is difficult in a standing position to get the patient to retain the correct position. You know the assistance of the X-ray in artificial pneumothorax. It is absolutely necessary

to have an X-ray taken in these cases, because, as you have seen from these plates, it is impossible from physical examination to tell what the effects of the treatments are or where the air is going.

If you take the plate in a posterior position you do not get the air and effusion, as in the other position. Oftentimes the adhesions will prevent air from going to the posterior position, and you must consider that. When you have given 1000cc or 1500cc, and you know there is air there, it is necessary to change your position. It is also necessary to see what damage you are doing to the mediastinum, in order to decide whether to continue or not. The heart displaced to the right side causes great dysponea, and the man who is giving pneumothorax should govern himself by this, in order not to go too far at one time.

It is very difficult for men who are not familiar with chest work to discover spontaneous pneumothorax. The same may be said of pleurisy with effusions. He may get all the symptoms, but unless he has especial skill it necessitates the use of the fluoroscopic screen to determine whether it is a spontaneous pneumothorax or pleural tears. In spontaneous pneumothorax, if you do not take the plate right away, you will have the entire side fill with air. In cases of induced pneumothorax it is a little slower.

Not very long ago I injected some bismuth in the side of an empyema, the man coughed it up, showing that it had gone through the pleural cavity into the bronchus and trachea. I think it is absolutely necessary to follow up these cases with the Roentgen plates, we cannot possibly do it in any other way. We do it in all cases in order to fully understand the case. Another advantage is to check up the other side and see if it becomes activated, and that is one of the reasons why pneumothorax fails. It is a good thing when good, but fails very often.

EXFOLIATION OF UPPER ANTERIOR INCISORS BY PRESSURE NECROSIS

R. A. Fenton, D. D. S.
Assistant Professor of Oral Surgery, State University of Iowa.

Patient: Young man, student, age 20.

On February 25, 1918 patient was referred for examination of teeth.

Personal and family history negative.

Patient had malocclusion and during year of 1915 was under orthodontic treatment. In December, 1915, with appliances in position, while coasting, patient ran into an automobile. He suffered a compound fracture of the tibia and also lost appliances from teeth. Orthodontia work discontinued. Since that time the four upper anterior incisors have been largely thrown out of alveolar process and present a fan-shaped appearance.

There was a small discharge of pus from near gingival of upper right lateral incisor.

The four affected teeth were very loose.

Roentgen examination (Fig. 1) showed only slight attachment of teeth in alveolar process, but no foreign body. Patient referred to orthodontist who advised extraction of the four teeth together with the temporary cuspids which were still in position.

On removal of these teeth in mass, a rubber band was discovered surrounding the four teeth near their apices.

The band having been lost at the time of accident, December 1915, under gum tissue and remained there over two years resulting in the destruction of the alveolar process to almost the root apices as shown in Fig. 1.

Fig. 1. Roentgenogram showing exfoliation of the four upper incisors.

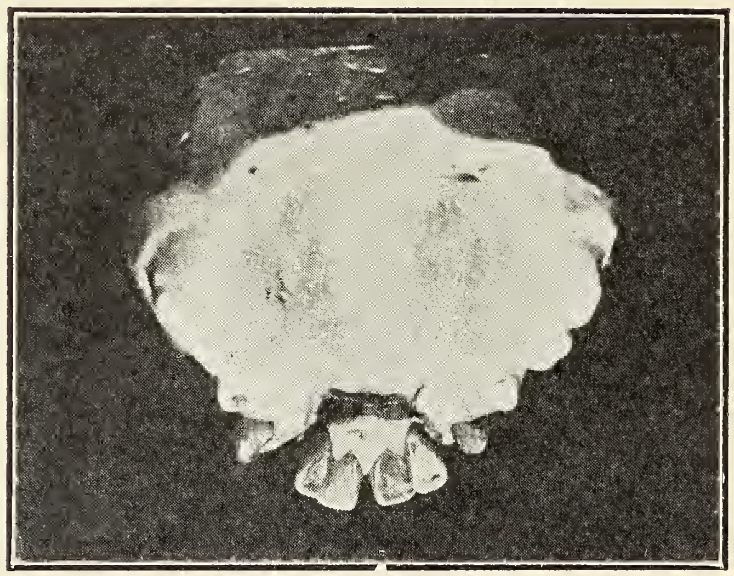


Fig. 2. Labial surface showing the four incisors and the temporary cuspids.

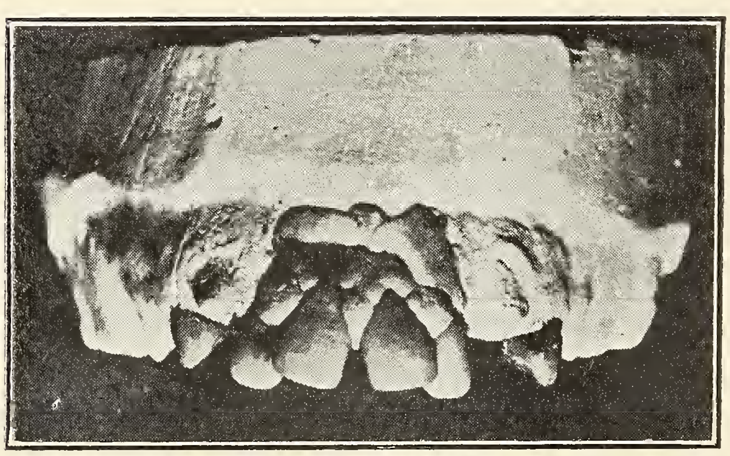


Fig. 3. Lingual surface.

THE PRESENT STATUS OF THE LOCAL APPLICATION OF RADIUM AND X-RAYS*

Walter A. Weed, M. D.
Birmingham, Ala.
Radiologist, Birmingham Infirmary

Owing to some obscure quality in our being which we, for lack of a better term, call "human nature," we are very prone either to ban or bless, most unreservedly and whole heartedly, any new discovery or invention. It may be that desperation over our inadequacy to cope successfully with such urgent problems as malignant growths was the prime reason for the enthusiastic welcome extended to the use of the X-ray. That the X-ray was a valuable agent to the surgeon was soon demonstrated, but because it did not immediately prove itself a wonder worker, it was relegated to the background to make way for the spectacular introduction of radium.

First greeted as a modern mystery of miracles, now, after a few years, bearing the condemnation of a few of our best known surgeons, radium is becoming known at its true value. It is not a panacea, it is not a fake; it is, properly used, one of the greatest agents known to the medical profession, and one whose value is not lessened by recognizing its limitations. We have not yet, in any branch of medical science or surgical art, discovered any remedy or method that we can truthfully consider infallible, even in carefully selected cases. Over a decade has passed since the accidental discovery of the therapeutic value of radium—over

*Reprint from *Radium,* Vol. XI, No. 3, June, 1918.

ten years of active use; yet only in the last four years have really practical methods of treatment been developed. We have been hampered by the extreme scarcity and great expense; yet, now that such large quantities of carnotite ore have been discovered and utilized in our own country, we may hope for greater opportunities for the therapeutic application of radium.

It is essential that some of the properties of radium and X-rays and methods of application be understood in order to demonstrate their value in the treatment of disease. The multitude of X-ray equipments all over the country has to a certain degree worn away its novelty; while the comparative scarcity of radium clinics leaves much to the conjecture of even the average doctor. Radium is constantly giving off three grades of invisible rays, the alpha, beta, and gamma. The range of penetration of the alpha ray is very short, but its chemical action great. The beta ray is more penetrating; it easily influences living tissue several millimetres below the surface and possesses certain chemical properties. The gamma ray is similar to the hard X-ray, but of shorter wave length and more powerful penetration. Therefore we have, in the therapeutic application of radium, four factors to consider: amount of radium, screening, length of exposure, and distance between the radium and the area to be treated. A fifth factor might be mentioned—personal idiosyncrasy. In the use of the X-rays we take into consideration the voltage and amperage of the current instead of "quantity" as with radium, the other factors being the same.

So far as is definitely known the action of both radium and X-rays is purely local. They have no effect, favorable or adverse, on metastases, nor will the treatment of a primary lesion effect a secondary growth of some other part of the body; the rays must be applied to the circumscribed area involved. Noted research workers, both at home and abroad, have proved and recorded these laws of radium:

near the location of a tube of radium, a complete local destruction of all tissues is effected, if so desired, depending upon screening, length of exposure, etc.; at slightly increased distance there is more or less gradual destruction of malignant cells with increased growth of connective tissue; beyond this there is only partial destruction of cancer cells with less overgrowth of connective tissue; still further on there is a stimulating effect to the malignant cells; after which, the radium has no effect.

The changes produced in the tissues by X-rays are similar to, but not identical with, those produced by radium, notwithstanding evidence to the contrary by a number of X-ray and radium workers of more or less repute. Wickham and Degrais[1] say: "If a current of electric sparks be passed into and split up in a glass vacuum tube (Crookes' tube), it is filled with special fluorescence, and certain rays, such as anode, cathode, and X-rays are produced respectively analogous to, but not identical with, the alpha, beta, and gamma rays of radium." My own experience leads me to believe that there is a difference in the biological effects of the two agents and that a radium dermatitis or ulcer heals much more rapidly than one produced by X-rays. Admitting that there is a close similarity between the effects of radium and X-rays, there would still be clear cut indications for both their separate and conjoint use. This is especially true in gynecological work, and in the treatment of malignant conditions involving cavities. Generally speaking, where there is a large area to be treated, as in carcinoma or sarcoma of the breast or a large area of obstinate eczema, the X-rays are to be desired; while in the treatment of uterine conditions, or in epitheliomata of the mucous surface radium is preferable because of its ease of application and because it can be brought into close proximity with the part to be treated. It might be said in this

[1] Wickham and Degrais: Quoted by Russell H. Boggs, in *American Journal of Roentgenology,* April, 1915, p. 731.

connection that, in my opinion, their combined use is often better than either when used alone.

Undoubtedly as we gain in knowledge and experience we will understand more clearly the varying and equal properties of these two great agents. We will no longer look upon them as rivals, but as partners; we will no longer madly advocate one because we possess it, but will endeavor to utilize it to its greatest capacity, and when necessary call upon the other. As our technic improves we will doubtless discover that in a great many conditions one is as applicable as the other.

The X-ray was first given great prominence in the treatment of epitheliomata, and although its first ardor of enthusiasm is passed, it is not only holding its own, but is constantly gaining ground in the treatment of malignant conditions of the cutaneous surface. In the hands of competent workers the relative percentage of cures is contesting strongly the percentage cured by radium. In several cases I have been able to obtain apparent cures with radium that had resisted treatment with X-rays by some of the most capable roentgenologists of the South. Perhaps the experience of other men may prove the reverse. It may be pointed out here that after all it might have been the combined use that did the work successfully, and that had radium been used in the beginning it might have been necessary, or at least advantageous, to follow with X-rays. In the treatment of nævi, small eczematous patches, keloids, etc., the consensus seems to favor radium as the agent of choice.

In the field of gynecology both radium and X-rays are of inestimable value, and are going to be used more and more as our technic improves and results become known. In cancer of the breast unless hopelessly inoperable, a thorough dissection is always advisable, followed by thorough X-ray or radium radiation. The X-ray is preferable because of the possibility of irradiating a large area more homogene-

ously than if done with radium. The X-rays are also preferable, in my opinion, in the treatment of large pelvic or abdominal growths for the same reason. For thirty years and more the surgical cure of cancer of the uterus has been the aim of some of the brightest minds of the profession; tireless efforts have been exerted to prevent, by surgical methods, the extension of the disease. The different methods of hysterectomy and in involvements of the cervix, amputation and cautery, all have been tried with varying degrees of success, but even in carefully selected cases the number of fatalities has been appallingly large. Even with present improved methods, and in the hands of most skillful operators, more than half of the cases fail to respond. Admitting these things as true, surgery still has precedence in a large number of cases. The operative treatment of malignancies confined to the fundus is always advisable. When the involvement is general it is a mooted question as to whether operation is best; it is impossible to remove all of the diseased tissue; tissues that formerly clung to the central organs are forced to retract back upon their posterior anchor, the pelvic wall. The pressure upon the sacral nerves is thus intensified sometimes to the extent of involving the lower limbs until the pain is almost unendurable; and, at the same time, the recurrent growth is rapidly increasing.

We have therefore adopted these rules: Operate in every approved operable case, as in former days. Use X-rays or radium immediately afterwards, but do not apply directly over the site of the incision. Use X-rays or radium again about four to eight weeks later. Radiate all borderline cases preferably with radium in the uterus and X-rays with a hard Coolidge tube through the abdominal wall. Use radium and X-rays in all advanced inoperable cases, not with the hope of effecting a cure, except possibly in an extremely small percentage of cases, but, because, when not

too far advanced, the growth may be retarded over a considerable period of time, nearly always alleviating the pain and checking the foul discharge. Also, it is sometimes possible to render an inoperable case operable.

In cases in which there is a large pelvic involvement, I favor highly a combination of radium and X-rays. It is thus possible to crossfire the tissues completely and thereby obtain the combined beneficial results from the hard rays of radium and the hard rays from the Coolidge tube. Doubtless to a great many the use of both radium and X-rays in the treatment of deep seated malignant conditions has been more or less a disappointment, however, there are other conditions, not of a malignant nature, confronting the gynecologist in which our expectations have been more than realized and our optimism justified. I refer especially to uterine fibroids with or without menorrhagia or metrorrhagia; also, to menorrhagia and metrorrhagia due to remote and indefinite causes.

Kelly,[2] in an article on The Radium Treatment of Uterine Fibroids, says: "Tumors of all kinds have been treated and the submucous and subperitoneal, and even the pedunculate, have seemed to respond as well as the interstitial." In reporting thirty-six cases he says: "The results in every case but one have been either the shrinkage of the tumor or its complete disappearance. . . . One of the most striking results," he adds, "is upon the menstrual function, where the radium can in all cases be depended upon to bring about complete amenorrhoea. . . . If care is taken to avoid giving too large a treatment, it is possible in some cases, especially with young women, to avoid amenorrhoea." Lange,[3] of Cincinnati, says: "The X-ray treatment of menorrhagia and uterine fibroids by the production of the artificial menopause has been given a new impetus by the invention of the Coolidge tube. . . . If

[2] Howard A. Kelly, *Surgery, Gynecology and Obstetrics,* March, 1917, p. 271.
[3] Sidney Lange, *American Journal of Roentgenology,* February, 1916, p. 72.

the proper technic is employed, the effect of the Coolidge tube radiation upon the ovaries is one of the most certain of medical phenomena. If sufficient radiation be absorbed by the ovaries they will cease to functionate in their fullest physiologic aspect and a cessation of menstruation will result."

It is thus seen that in the hands of competent men the results obtained, although produced by different agents, are practically parallel. However, I do not think the indications are by any means always the same, and that the method most available can always be substituted for the other. My own opinion is that in selecting the method of treatment of uterine fibroids we should be governed by the type of tumor to be treated, and also should take into consideration other conditions that might be complicating factors. Kelly[4] says: "While radium has thus made a place for itself as the treatment of election, the best possible treatment in fibroid tumors, it does not take the place of operation in the exceptional case, for instance, where there are urgent pressure symptoms, or other complicating conditions, such as diseased appendix, gallbladder, etc."

The submucous varieties, by reason of their location and consequent composition, cause copious and weakening hemorrhages, and there is a resulting complication of the endometrium. For this reason radium is preferable to X-rays in such cases, as it acts directly upon the endometrium thus causing a cessation of the bleeding by its effects upon the endometrium primarily and the ovaries secondarily. While the X-rays perform the same phenomenon, it is by affecting the ovaries primarily and, possibly to a less degree, the endometrium. Therefore, the radium produced menopause is usually much less severe in its effects than that produced by X-rays. In the interstitial and subserous varieties, I also believe that radium is more dependable than X-rays for reasons already explained, while in the pedunculate the

[4] Howard A. Kelly, *Woman's Medical Journal*, January, 1916.

X-rays are probably as efficient as radium. In both the subserous and pedunculate tumors I believe their combined use—radium in the uterus and X-rays through the abdominal wall—is theoretically and practically correct.

Radium is of equal value in the treatment of obstinate cases of menorrhagia and metrorrhagia not associated with fibroid tumors. In a great many of these cases it is desirable to bring on the menopause as there is often danger of impending malignancy. This is invariably accomplished easily with but few of the pronounced symptoms that usually accompany the menopause. It is preferable to the X-rays because it can be given with much less inconvenience and risk to the patient; also, as the endometrium is primarily affected and the ovaries secondarily, the nervous phenomena accompanying and following the menopause are much less noticeable. In the treatment of menorrhagia of young women the dosage is so easily regulated that the desired effect may be produced in many cases without bringing on a complete amenorrhoea, the functioning power of the ovaries not being entirely destroyed. I have treated a number of cases of uterine hemorrhage in which the patients had had repeated curettages without receiving permanent benefit; not one of these cases failed to yield to radium. One advantage not mentioned of radium over X-rays in the treatment of pelvic conditions is that, by virtue of its method of application, there is no danger of dermatitis. It is known that the mucous membrane is far more tolerant of both X-rays and radium than is the cutaneous surface. This is no little consideration in the treatment of these conditions. When both are used conjointly it is always possible to keep the dose of the X-rays well within the bounds of safety.

I have made no attempt to discuss the various conditions more or less amenable to radium and X-rays, but to mention only some of those in which their value as therapeutic agents is firmly established and their supremacy acknowledged.

Washington, D. C., June 21, 1918.

My dear Doctor Orndoff:

I regret very much the necessity that compelled me to send you a telegram today telling you of my inability to attend the midsummer meeting of the Western Roentgen Society. I value your kind invitation very highly and had hoped to be able to accept it, but circumstances have arisen in connection with my work that make it impossible for me to be absent from Washington at that time. I was especially anxious to speak to the Society with regard to the coming need for Roentgenologists in the army and to attempt to clear up some minor points of misunderstanding that seem to have arisen.

Up to the present time we have been able to supply Roentgenologists as the need for them arose, but the time is fast approaching when the services of all Roentgenologists who can possibly enter the service will be needed.

One of the misunderstandings that I wished to clear up is that there is no certainty that roentgenologists would be assigned to X-ray work after entering the army. This idea probably gained credence because of the fact that it was necessary during the first years of the war to train many men in military roentgenology in order to make their services available when need should arise. Until active operations began in France we had many more roentgenologists than were needed just at that time, and this resulted in some cases in their being temporarily assigned to other medical duties. This condition will probably not arise again during the war. At the present time the roentgenologists are being assigned to X-ray work as soon as they have finished the course of instruction in military roentgenology.

The methods of instruction have undergone a number of changes since the establishment of schools in various parts of the country during the early months of the war. All instructions in military roentgenology will now be carried out at the Medical Officers' Training Camp at Fort Oglethorpe, Georgia, A large school has been established there with Major Willis F. Manges as Director. The course of instruction is based upon French, British, and Italian experience and upon our own experience in the various schools since the war began. All roentgenologists entering the service will receive there some instruction along military lines and will then be given instruction in X-ray work according to their ability and experience. Special attention will be given to methods of localization of foreign bodies. Our experience up to this time shows that all roentgenologists, however experienced, receive great benefit from such a course of instruction.

I will be very grateful to you if you will impress upon the members of your Society the fact that the need for roentgenologists will become acute within the next two or three months.

I am directed by the Surgeon General to thank you for your efforts as President of the Western Roentgen Society to secure applicants for commission in the Medical Reserve Corps and to assure you that every effort will be made in this office to assign men to the work for which they are especially qualified.

With kind regards.

Very sincerely yours,

A. C. Christie,

Lieutenant Colonel, Medical Corps, N. A.
Chief of X-Ray Division, Surgeon General's Office.

PROGRAM

Kansas City, Mo., July 25, 1918.

At meeting of the Kansas City Roentgen Club held in the office of Dr. O. W. Swope, Dr. Knerr reported and exhibited plates of a case of hematogenous sarcoma of tibia in child in which unusual response to treatment was evident. Seven other cases of therapeutic interest were included in his report.

Those present were O. W. Swope, Martha Bacon, L. A. Marty, Captain Clyde Donaldson, George E. Knappenburger, Dr. Nelson, E. B. Knerr, and O. H. McCandless.

Annual Meeting of the Western Roentgen Society, Nov. 21, 22, and 23, 1918, Chicago, Illinois. Regular Headquarters—Sherman Hotel.

Dr. Alden Williams, Grand Rapids, Mich.
"Chest Inconsistencies."

Dr. M. J. Hubeny, Chicago, Illinois.
"Filling Defects of the Alimentary Tract Due to Extra-Alimentary Causes."

Dr. Henry Schmitz, Chicago, Illinois.
"The Value of the Roentgen and Radium Rays in Treatment of a Series of Six Hundred Cases with Various Pathological Conditions."

Millard B. Hodgson, Rochester, N. Y., and C. E. Fawkes, Rochester, N. Y.
"A Simple Slide Rule for Computing X-Ray (Roentgen-Ray) Exposures."

Dr. Fred C. Zappfe, Chicago, Illinois.
"Roentgen Organization in America."

Dr. M. J. Sandborn, Appleton, Wis.
"A Resumé of Work in Conjunction with Advisory Boards."

Dr. Will Ultes, Springfield, Ohio.
"Filing, Recording, and Indexing Roentgenograms and Roentgenographic Library."

Other doctors whose names will appear on our program, but the titles of their papers will be announced later:

Dr. Amy Peterson, Chicago, Ill.
Dr. Robt. L. French, Chicago, Ill.
Dr. Adolph Hartung, Chicago, Ill.
Dr. A. N. Clagett, Chicago, Ill.

The letter from Major Willis F. Manges announcing the dates of the September meeting of the American Roentgen Society at Camp Green Leaf, will provide a splendid opportunity for Roentgenologists to observe something of the character of recent developments in military roentgenology. This meeting will be undoubtedly highly interesting and exceptionally instructive. I feel that it is the duty of Roentgenologists as far as possible to attend this meeting and avail themselves of this opportunity to understand the demands for Roentgenologists.

Abstracts

PYELOSCOPY

By Willis F. Manges, M. D.
Major M. R. C. U. S. Army

The American Journal of Roentgenology, April, 1918

Pyeloscopy aids greatly in plelography and adds comfort and safety to the patient. Moderately fine focus Coolidge tube is used and the screen is illuminated from the tube when using three or four-inch spark gap resistance and 10 to 30 milliamperes of current. The resulting rays of low penetration allow the operator to assume less risk because of less scattered radiation. It is essential to be able to change promptly from fluoroscopic to roentgenographic adjustment in order to obtain record of various degrees of distention. After permitting about 2 cc. to enter the pelvis, the outlines can be discerned and the catheter withdrawn to the desired distance. A normal pelvis is readily recognized before it becomes over-distended. Regurgitation along catheter is easily detected. Pyeloscopy shows the catheter does not move synchronous with the kidney during respiration, while the opaque substance and calculi do move during respiration.

Bifurcation of uretus are determined without difficulty. Distended gall bladder differentiated with certainty.

Movement and rotation of kidney intelligently studied because the distention of the pelvis is under observation over-distention can be controlled, consequently the procedure may be carried out under general anesthesia with safety.

B. H. O.

Archives of Diagnosis, October, 1917, Vol. X, No. 2

Diagnostic Value of the Duodenal Tube and X-Ray Findings in Ulcer of the Stomach and Duodenum, by Carl Beck,

Chicago. Author barely touches upon the possibilities of roentgen examination and seems to be inclined to give little credit to same. He dwells upon the (frequently and rightly condemned) exploratory opening of the stomach as a means of diagnosis.

Archives of Diagnosis, July, 1917, Vol. X, No. 1

Diagnosis and Prognosis of Urinary Stone in the Infant and Child, by Arthur N. Collins, M. D., Duluth, Minn. The essayist covers the subject in a very comprehensive manner. He says that if the roentgenogram is important as a diagnostic agent in the adult, it is of greater importance in the infant, where it has served to point out many errors. He mentions a case reported by Hartman where great surprise was experienced where no roentgenogram was made and a stone was found at autopsy. He rightly contends that no examination is complete without Roentgen examination. Leonard's and Beneke's statistics are quoted and Carl Beck's advice that entire urinary tract should be examined by roentgen ray is recommended along with other helps regarding technique of the examination.

Pitfalls in Diagnosis in Pediatric Practice, by Godfrey R. Pisek, New York. In discussing empyema thoracis fails to mention the Roentgen examination as an aid in diagnosis. He gives due credit to the value of the Roentgen ray in differential diagnosis of tumor from pylorospasm.

Abdominal Pain. Its Differential Diagnosis, by Robert Franklin Ives, Brooklyn, N. Y. This exhaustive and extensive discussion should be read and profitably re-read by everyone interested in diagnosis.

I. S. T.

The Differential Diagnosis of Chronic Duodenal and Gall Bladder Disease, by Jacob Gutman, Brooklyn, N. Y. The subject of this highly valuable article is one close to the

hearts of all roentgenologists. In this instance it is discussed thoroughly and from the various aspects.

The author gives due credit to the roentgen examination as a diagnostic means and his conclusions—based as they are upon the correct reasoning—are that the roentgen examination is a most important and extremely valuable aid.

His condemnatory remarks regarding exploratory operations are certainly true. He says, "It is deplorable when so many exploratory laparatomies are made with enormous incisions prepared for all probabilities, simply because no serious attempt is made beforehand to ascertain and localize the diseased area. With better pre-operative attention and greater efforts a great deal of post-operative invalidism would be avoided.

Exopthalmic Goitre. Remarks on the Symptomatology, Prognosis and Non-Surgical Treatment, by ISREAL BRAU, Philadelphia. The roentgen ray is mentioned as useful in diagnosis. In discussing the non-surgical treatment author fails to mention roentgen treatment.

Abnormal Uterine Hemorrhage in Young Women, by ARCHIBALD MCDONALD, Duluth, Minn. Roentgen ray treatment is mentioned among therapeutic measures applicable to essential hemorrhage and two of the theories of its mode of action are discussed.

An erroneous statement that "Successful treatment in young women, however, usually results in an objectionable menopause", etc., should not be passed unchallenged as regards roentgenization.

I. S. T.

Archives of Diagnosis, July, 1918, Vol. XI, No. 1

Announcement made that a department of Roentgen Ray Diagnosis under the editorship of Dr. I. Seth Hirsch, states that "The application of the roentgen ray as a diagnostic

agent in every field of medicine and surgery has made this method an indispensable one to the clinician''. (While this is entirely true, it is very late, inasmuch as this magazine is beginning its eleventh year of publication.)

I. S. T.

The Journal of the Röntgen Society, London, Eng.

July, 1917, Vol. XII, No. 50

The Physical Properties of Intensifying Screens, by T. Thorne Baker, F. C. S., A. M. I. E. E. Author exhaustively discusses intensifying from all physical standpoints, shows by various curves the relations between the screens and roentgen light, exposure and density, etc., etc., and goes into the details of the physics of his subject. A most admirable resumé and discussion well worth the attention of anyone at all interested in screens.

A New Screen Localizer, by Major Stow. Author describes a simple—crossed wire sliding ring—apparatus which from the description should be applicable in field military service.

The Future of the X-Ray Industry, by Geoffrey Pierce. After an exhaustive and enlightening discussion of the subject by the author, there was discussion from historical, medical, manufacturing, engineering and other standpoints that was certainly illuminating. This subject was under consideration during three meetings of the Society and was discussed by Drs. Robert Knox, Mackenzie Davidson, G. B. Battin, J. Metcalf, Prof. Alf. Porter, Lieut. Col. Robert Wilson, Capt. G. W. C. Kaye, Messrs. H. C. Head, R. S. Wright, Cuthbert Andrews, James H. Webb, P. J. Neale, W. F. Higgins, A. E. Dean, B. H. Morphy, W. E. Schall, and others, each presenting the matter in the light of their own observations and making an ensemble of the aspect of Roentgenology at this time well worthy of careful study.

I. S. T.

BOOK REVIEW

Oral Sepsis—In Relationship to Systemic Disease, by William W. Duke, M. D., Ph. B., Kansas City, Missouri, Professor of Experimental Medicine in the University of Kansas School of Medicine; Professor in the Department of Medicine in Western Dental College; Visiting Physician to Christian Church Hospital; Consulting Physician to Kansas City General Hospital, Kansas City, Missouri, and to St. Margaret's Hospital, Kansas City, Kansas; with one hundred and seventy illustrations. C. V. Mosby Company, St. Louis.

The author has succeeded in making a rather difficult subject very entertaining. The first chapter contains an essay by Benjamin Rush, M. D., published in 1818, which coincides rather startlingly with our modern conception of teeth sepsis. The mechanical and bacterial causative factors are carefully compiled and strikingly illustrated. End results from palliative treatment, in collaboration with conservative dental surgeons, are shown. Systemic end results are considered and compared. The toxic effect of oral sepsis dealt with in Chapter IV should be read carefully by every roentgenologist making dental roentgenograms. Allergy and anaphylaxis are considered comprehensively in a single chapter with "a summary of the theories which have received most general acceptance".

The busy roentgenologist has in this one hundred and twenty-five page volume entertainingly compiled a summary of medical, dental, pathological and roentgenological data that could not be obtained by years of individual research. Something of the effort in compilation may be conceived when we find in the bibliography over two hundred authors and articles of reference.

O. H. McC.

RESPONDING TO THE COUNTRY'S CALL

Alguire, Captain Alden. Camp Greenleaf, Chickamauga Park, Ga.

Burcham, Major T. A. Somewhere in France.

Donaldson, Lieut. Clyde.

Donavan, Lieut. J. J.

Gilmore, Captain W. H. Fort Oglethorpe.

Hecker, Captain William.

Lier, Captain C. N. O. Somewhere in France.

Lowry, Lieutenant N. H. Boston—to receive instruction in Orthopedic Surgery.

Lucas, Chas. G.

McConnell, Major M. R. C. Guthrie. Department Laboratory, Fort Leavenworth, Kan.

Merritt, Major E. A. Surgeon General's Office, Washington.

Meyer, Lieut. V. J.

O'Hara, Captain Fred S. M. R. C. Hospital Unit W, Camp Hospital No. 40, American Rest Camp, Liverpool, England.

Wahl, E. W.

The above list of members of the Western Roentgen Society in various branches of the Army and Navy include all that we have been able to locate to date. A few of the addresses given are doubtless incorrect, and we would appreciate any additions, corrections, or changes of addresses with which you may be able to supply us.

THE
JOURNAL OF ROENTGENOLOGY

Published by the Western Roentgen Society, Inc.

VOLUME I — Third Quarter, 1918 — NUMBER 3

CONTENTS

THE JOURNAL OF ROENTGENOLOGY is the official publication of the Western Roentgen Society, Inc., and is published under the authority of the Society.

Address communications and manuscripts for publication to the Editor, Dr. Bundy Allen, Iowa City, Iowa.

Subscription rate—$5.00 per year, $1.50 per copy.

PRESIDENT

EDITORIAL

The following is respectfully submitted for the consideration of the Roentgen profession. There probably has, or will not be within the very near future, a more opportune time for the organization of the Roentgen profession, than the present.

Geographically, the Roentgenologists of America are necessarily very distantly associated. Evidently, there are large numbers of high class Roentgenologists who do not feel disposed, financially and otherwise, to attend the annual Roentgen meetings held across the states from their respective places of business.

Of course, there isn't any one who would not agree that each member, of the rank and file of Roentgenologists, should keep abreast of the rapid progress of the roentgen science. No better opportunity can be afforded than frequent association among the Roentgenologists and especially in collaboration with men of the allied sciences.

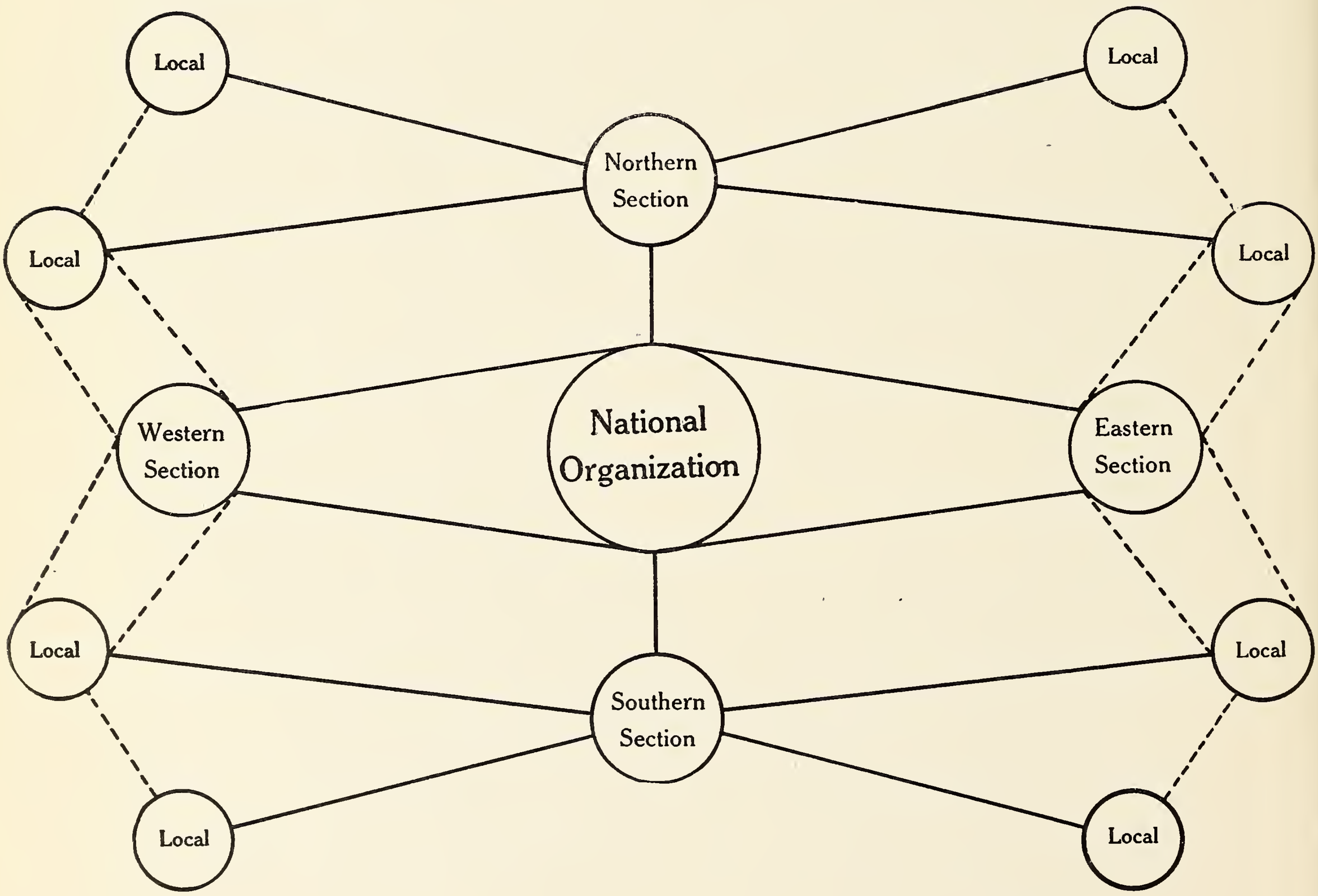
However, Roentgenologists who are very active in attendance to scientific meetings need not feel that they are duty bound to see that the more inactive, or apparently disinterested, workers' activities be increased. Also it is well established that one of the principles of an organization is to stimulate interest in them which is best accomplished by contact with one another.

It would seem the organization of Roentgenologists can, at the present time, be very easily accomplished. Organizations, without regard to standards, would not fill their fullest function. Therefore, the requirements determining eligibility for membership of the present society must not be lowered for the sake of increasing the membership. If

the various Roentgen organizations could be so amalgamated into, say, the national organization of America, a better coöperation and stronger scientific union can be had and maintained, most advantageously, to all concerned. The national to be a union of all eligible Roentgenologists, from all local sections, etc. The main, or national, organization, meeting annually in connection with, just preceding or following, the American Medical Association. Naturally, such an organization would give the Roentgenologist an opportunity of attending the two national meetings, at a minimum expenditure of time and energy.

As stated above, "submitted for your approval," and will add that any additions or corrections and comment, for or against the amalgamation, will be welcomed.

Schematically, such an organization can be outlined as follows:



B. A.

THIS PAGE WILL BE GIVEN IN EACH ISSUE OF THE JOURNAL FOR ANY SPECIAL ANNOUNCEMENT THAT THE PRESIDENT OF THE ORGANIZATION MIGHT HAVE FOR THE MEMBERS OR THE READERS.

To the Readers of the JOURNAL:

Experienced Roentgenologists, who are physically able, must make arrangements to accept assignments by those in charge of the division of Roentgenology of the U. S. Army. With all the splendid efforts manifested in this division to supply Roentgenologists, the present demand seems imperative.

Without doubt the largest and most efficient Roentgen school yet established in the world is running full time at Camp Green Leaf, Ga., under the direct leadership of Colonel Willis F. Manges. Information received by both observation and contact with officers in training convince me that the work being accomplished is magnificent in character. The organization of this school represents the product of the combined efforts of America's greatest Roentgenologists.

Too much cannot be said to extol the equity manifested in the construction of the entire Roentgen division. The heaviest burdens and responsibilities have been shouldered by Colonel A. W. Christie and Colonel Geo. C. Johnston. The fair minded treatment accorded one who presents his qualifications and asks for an assignment is but one confirmation of the superior ability demonstrated by these men.

It is evident that considerable time is required to produce a "trained Roentgenologist". A recent communication from Colonel Johnston states, "The school at Camp Green Leaf is doing most excellent work and providing us with

large numbers of men available for duty, primarily as assistants under more experienced men . . ."

The membership of the Western Roentgen Society have united in a most admirable manner to do their share in the division of Roentgenology. A glance at the honor roll in conjunction with a consideration of the character of our membership is a satisfactory certification. However, there are yet qualified Roentgenologists in our membership who are able to commit their ability and qualifications to the relief of the urgent and honest call from this splendidly organized division. In consideration of these circumstances, an assignment should not be looked upon only as a mark of patriotism nor a duty, but a privilege to have the opportunity to apply the talent we have developed in such a manner as to accomplish the most good for the general cause.

President B. H. O.

TUBERCULAR LESIONS OF THE LUNG PARENCHYMA*

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In this paper, I propose to discuss only those lesions of the parenchyma which represent reaction to infection by the tubercle bacilli.

My purpose in choosing this as my subject is twofold.

1. It is my conviction that certain specific changes in the lung parenchyma can be recognized roentgenologically. Recognition and tabulation of these changes offer a basis for the accurate study of the gross pathological lesions. Finally, when the true character of a lesion can be detected we will be in a position to construct a classification which may possibly be universally adopted.

2. The hope that discussion before this body of Roentgenologists may stimulate our efforts as well as to give us new ideas and fix firmly the relation existing between these lesions from the pathological standpoint.

The outline which I will endeavor to follow will be:—

1. To discuss lesions that are recognized pathologically and occurring in non-sensitized as well as sensitized tissue.

2. To describe as far as possible the Roentgen findings when such lesions are present.

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*Read before the Chicago Roentgen Society, November 11, 1918.

3. To consider the relative value of Roentgen methods as compared with other methods in the diagnosis of these lesions.

4. To demonstrate so far as possible by lantern slides Roentgenograms of these lesions.

Pathological Discussion

A *lesion* as we refer to it here may be defined as the tissue manifestation of infection with the tubercle bacillus.

Portals of entry for tubercle bacilli to the pulmonary parenchyma may be by any one of four routes.

1. Bronchial or aerial area.
2. Blood or hematogenic
3. Lymphatics or lymphogenic
4. Contiguity

The character of lesions revealed at post-mortem and by Roentgen examination vary greatly. Some of the causes which are responsible for this variation may be

1. The character of resistance manifested by the tissue, *e. g.*,
   a. Sensitized tissue.
   b. Non-sensitized tissue.
2. The virulence of the tubercle bacilli.
3. The route of the entrance of the infection.
4. The extent of the bacterial disturbance at the time of inoculation.
5. Concomitant infections.

The variation in the tissue reaction as the result of the variety of causes above mentioned seems to follow somewhat definite lines of cause and effect with the result that we are able to describe more or less specific lesion. These lesions are prone to merge from one into another through the agencies of degeneration or regeneration.

A. *The Initial Lesion of Tuberculosis.*

This lesion occurs in non-sensitized tissue, *i. e.,* the tissue of a child or an individual or animal whose system has never been sensitized by the toxic proteins of bacterial metabolism. The site of this lesion may be in any of the tissues of the body, but is by far most frequent in the lung parenchyma. It is described as being situated in the subpleural tissue, and seldom located in the apex of the upper or lower lobes. Ghon states 61.27 is located in the right lung, 38.73 in the left lung. The lobe involved in order of frequency is U. R. 30.98; U. L. 23.24; L. R. 22.54; L. L. 15.49; and the middle right lobe 7.75 The size of the lesion is described as varying from the smallest visual object to a centimeter in diameter. The size depends upon the number of individual tubercles in the conglomerate mass. The area is macroscopically well defined—dry on section and cuts with resistance. Microscopically it shows the various structures of tubercle formation and disintegration, areas of liquefaction adjoining areas of caseation and still others with petrification. More often one distinct form of tissue degeneration is observed. The time required for tubercle formation in non-sensitized individual is stated to be about ten days.

This paper does not permit me to discuss the cellular pathology in the story of the formation of this lesion or tubercle. In order to carry a clear conception, however, into the description of the following lesions, one must remember that it is this lesion that seldom, if ever, is completely healed. The fact that the anemic demarcating zone of dense connective tissue isolates to the proper degree the center with its virulent colony of organisms, present the proper elements to keep our tissues in a state of constant sensitation. It is this sensitation of our tissues which permits over-reaction described by Krause and constitutes the principal factor in our immunity against this dreaded plague. This tissue over-reaction in sensitized tissue is the

basis of tuberculin reactions. In fact, all protein reactions and probably offers the explanation for the beautiful and significant work which Maude Sly has recorded in her experiments with malignancy in mice. In short, we may then conclude that the unhealed tubercle in the initial lesion is responsible for our tissue sensitation, which permits sufficient tissue over-reaction to hold us immuned to tuberculosis and at the same time not permit the degree of tissue over-reaction that would render us liable to cancer.

B. *Secondary Lesions of Tuberculosis.*

It is this class of tubercular lesions which represents the lesions encountered clinically. These lesions can only occur when the inoculating doses of tubercle organism are sufficiently massive to survive the tissue over-reaction tendered as their reception upon inoculation into sensitized tissue.

1. The earliest lesion which can be definitely detected was pointed out by Dr. H. K. Dunham and popularly known as Dunham's fan or cone. As previously stated this lesion occurs in sensitized tissue. The early tissue manifestation following inoculation is similar to that described as the initial lesion. The time required in its consummation is a matter of a few hours as compared with the ten day period in non-sensitized tissue. In addition, there is the lymph engorgement in the zone surrounding the point of inoculation limited in lung parenchyma by anatomical construction of the lobules, which characterizes the early tissue response in sensitized tissue as a tuberculin reaction plus tubercle formation. It is probably possible that this lesion may be well defined and permit recognition roentgenologically within a few hours following the inoculation. These lesions occur as the result of the deposit of tubercle bacilli beneath the mucosa in the region of the junction or branching of the smaller veins, arteries or bronchia and also near the ductuil alveolaris or smaller air spaces, as pointed out by Miller. It is evident that this lesion will be cone or fan

shape and in a position, as Dunham has pointed out, with its base towards the periphery and its apex toward the hilum.

2. *Diffused Infiltration.*

This lesion indicates an older type of secondary lesion than the one just described. The pathology of its formation is very similar to the type just described, but owing to the fact that many lobules in a given lobe have been inoculated at different intervals account for the variation in the lymphatic engorgement. The air spaces show but little exudate and certain lobules show less encroachment upon the air spaces by the lymphatic engorgement than others, with the result that the infiltrated area shows varying degrees of cellular deposition.

3. *Consolidation.*

This lesion indicates all the anatomical and cellular changes noted in the above types of lesions and in addition presents exudation into the air spaces and the obliteration of air from the affected areas. The variations in density in a consolidated area are due to the variations between the densities of the exudate and the interstitial tissue. At this point, the story of the pathology must take one of two courses. The exudate must undergo degeneration and elimination from the site of consolidation while the bronchial arterial system furnishes nutrition and maintenance of the interstitial tissue or the interstitial tissue will undergo degeneration synchronously with the disintegration of the exudate.

4. *Cavitation.*

This lesion may represent the first disintegrating process following consolidation. It may signify that the cellular elements in the exudate as well as the interstitial tissue has undergone a liquefaction necrosis and that the subsequent liquid media has escaped from the original site and usually into a bronchus.

5. *Caseation.*

This lesion is characterized by a coagulation necrosis of the cellular elements of both the exudate and the interstitial tissue and later found degenerating, simulating fatty degeneration with the result that a mass is formed which simulates to some extent cheese and is designated caseation.

6. *Calcification or Petrification.*

This lesion is characterized by the deposit of calcific masses in the marginal zones of caseous masses and may later be deposited in the material and may finally replace the caseous material almost if not entirely.

7. *Fibrosis.*

This lesion is the connective tissue response to protein irritation and is present at the marginal zone of certain tubercular lesions as well as along the course of the lymphatic system, bronchi, pleura, etc.

8. *Pleuro- and Broncho-Parenchymal Lesions.*

These lesions are characterized principally by lymphatic engorgement, decreased aerial contents of the adjoining parenchyma and consequently increase of densities in the area and newly formed lesions. Later the density is maintained by connective tissue proliferation or fibrosis.

Roentgen Findings

A. *The Initial Lesion.*

This lesion is practically never certainly detected. When petrification is present it may appear on the roentgenogram as a minute and very dense area. (See illustration No. 540.) The size is from the smallest density visible on the roentgenogram to a centimeter in diameter. Small dense areas frequently appear on roentgenograms in the lower lobe, of both tubercular and non-tubercular patients, and it is possible that this may indicate the site of the initial lesion.

Again a small dense area may appear in an area showing

evidence of secondary infection and we may suggest that the density may indicate the site of the initial lesion.

When the lesion possesses no calcium its recognition is still less certain.

B. *Secondary Lesions.*

These lesions may occur separately but usually there are two or more present. The roentgen findings are dependent entirely upon the pathology of the lesion.

It is the fact that one can determine so accurately the number, location, extent and kind of lesion that we are able to derive so much aid from the roentgen findings, in formulating a reliable diagnosis and prognosis.

1. *Dunham's Fan or Cone.*

It is difficult to convey in a written description adequate conception of the appearance of this lesion in a stereorono-gram. This difficulty evidently led Dunham to adopt a phraseology which is indeed distinctive, and which at the same time offers little possibility of improvement.

The triangular or cone shape is seldom at right angles to the line of vision, a fact which is frequently misleading to the more inexperienced. Another element of confusion in the roentgen study of this lesion is the fact that one recognizes periphery to indicate the surface visceral pleura, consequently the base of certain lesions will not be found to face this surface. This is eliminated when we fix in our minds a clear conception of the approximate locations of the interlobar pleural surfaces. (See Figures Nos. 1 and 2.)

The typical lesion always presents the triangular or cone shape, but the number of lesions encountered with a typical shape prevents this characteristic from carrying the strong diagnostic value it would, were the exception not so frequent. (See illustrations Nos. 8830, 4829, etc.)

The density variation from the adjoining lung parenchyma usually appears to be the result of intermingling of numerous lines of varying densities. These lines probably

represent lymphatasis and interstitial infiltration within the confines of the secondary lobule,—the anatomical unit of the lung,—as pointed out so nicely by Dunham and Miller. The tortuous course of these lines gives the appearance of intermingling and crossing and the width of the lines as compared with the intervening space or mesh is of diagnostic significance. The intervening space may show greater density than the adjoining parenchyma and this density or clouding in the lesion is also of diagnostic significance.

The size or area of this lesion varies from the size of a grain of buckwheat to one whose apex reaches the hilum and its base at the lung surface.

The location is almost always in the upper portion of the upper lobe, except when it is found in conjunction with other and more destructive lesions.

2. *Diffuse Infiltration.*

The lesion appears as a clouding, or density increase of varying degrees. It may assume any shape and it is usual for one margin to be bounded by pleura. (See illustration No. X.) It is a frequent observation to find that one portion will show dimly an increased density, and presenting sufficient characteristics to warrant the conclusion that it represents a fan lesion of more recent origin than the other portions of the lesion. The density is of a quality that signifies the presence of air filled spaces throughout, and thereby distinguishes it from consolidation.

3. *Consolidation.*

The findings in this lesion are the degree of density, which exceeds that described as cloudy, and the homogeneous tendencies. (See illustration No. 586.) It may appear to have varying densities when viewed through other portions of lung tissue whose densities vary greatly. Its margins are often well defined. It may adjoin an area of diffuse infiltration and seem to taper in density to the normal parenchyma.

4. *Cavitation.*

This lesion usually occurs within a lesion of consolidation. Its density varies inversely to the above lesions, *i. e.,* the larger the lesion the less the degree of density. The margin of the lesion presents a degree of density varying from almost that of diffuse infiltration to that of petrification, depending upon the pathology of the surrounding lesion. In all cases the density is less than the surrounding elements. The shape is often irregularly spherical, but may be of any shape.

5. *Caseation.*

This lesion like cavitation exists only in conjunction with other lesions. (See illustration No. 10021.) There are not distinct roentgen findings indicating caseation to the exclusion of other lesions. Caseous areas vary in size from smallest visually possible object to a few centimeters in diameter. There is usually a margin of consolidation or fibrosis and if the latter a shell of calcium deposit is frequently noted. In later stages the calcium may permeate the entire caseous mass.

6. *Calcification or Petrification.*

The findings in this lesion are self-evident, and seldom present any difficulty in diagnosis. The ever available contrast with other structure which contains natural calcific deposits renders their recognition almost certain. No other lesion of similar size presents such an intense degree of density.

7. *Fibrosis.*

This lesion is indicated by increased degree of density, and is recognized usually in conjunction with other lesions. Its principal locations as, *e. g.,* margins of cavities, interlobar pleuricies, along the course of the bronchi in low grade broncho-pleural lesions, etc., all are a material aid in determining the identity of fibrosis.

8. *Pleuro- and Broncho-Parenchymal Lesions.*

These lesions show increased densities in conjunction with these structures. The densities vary in accordance with the character of the inflammatory reaction in the structures. If the reaction is acute the densities may suggest more the character of diffuse infiltration, but if chronic manifestations are present in the structures the density will suggest more the character of fibrosis.

Relative Value of Roentgen Methods

In discussing this phase, we must not allow our enthusiasm to carry us away from the fact that Roentgen Rays reveal findings upon which a diagnosis may be constructed. It is the intelligent correlation of findings from various methods of diagnosis which renders valuable and reliable diagnosis and prognoses.

It is of the utmost importance that findings from any method of diagnosis be properly recorded for consideration.

Roentgen methods offer more findings of value in determining the character, location and extent of parenchymal lesions than all other methods combined.

No method or collection of methods in diagnosis will so clearly reveal the antemortem pathology as compared with the postmortem anatomical and pathological diagnosis.

Roentgen findings, frequently recorded, seem almost indispensable to the clinician in the proper treatment and management of cases.

It is my hope that by accurately recording the true pathological lesions, their character, extent, location, size, number, age and activity, utilizing any or all methods of diagnosis we may be in a position to classify tuberculosis of the lungs in such a manner as to permit its universal adoption.

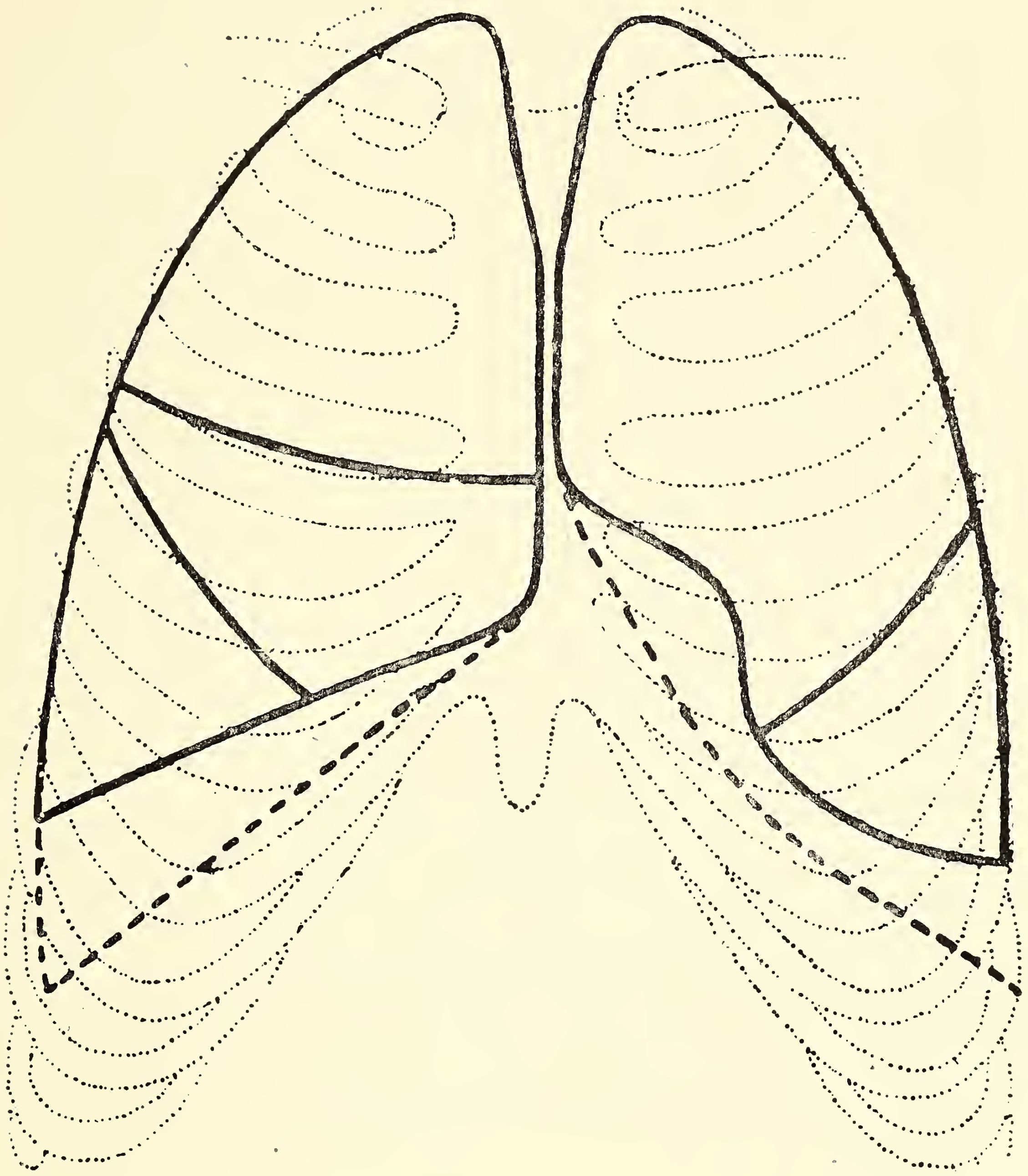


FIGURE 1

This figure illustrates the approximate location of the lobes of the lungs as the patient appears before the fluroescent screen in the upright posture. It will be noted that the upper lobe covers considerably more than half of the anterior surface of the lungs.

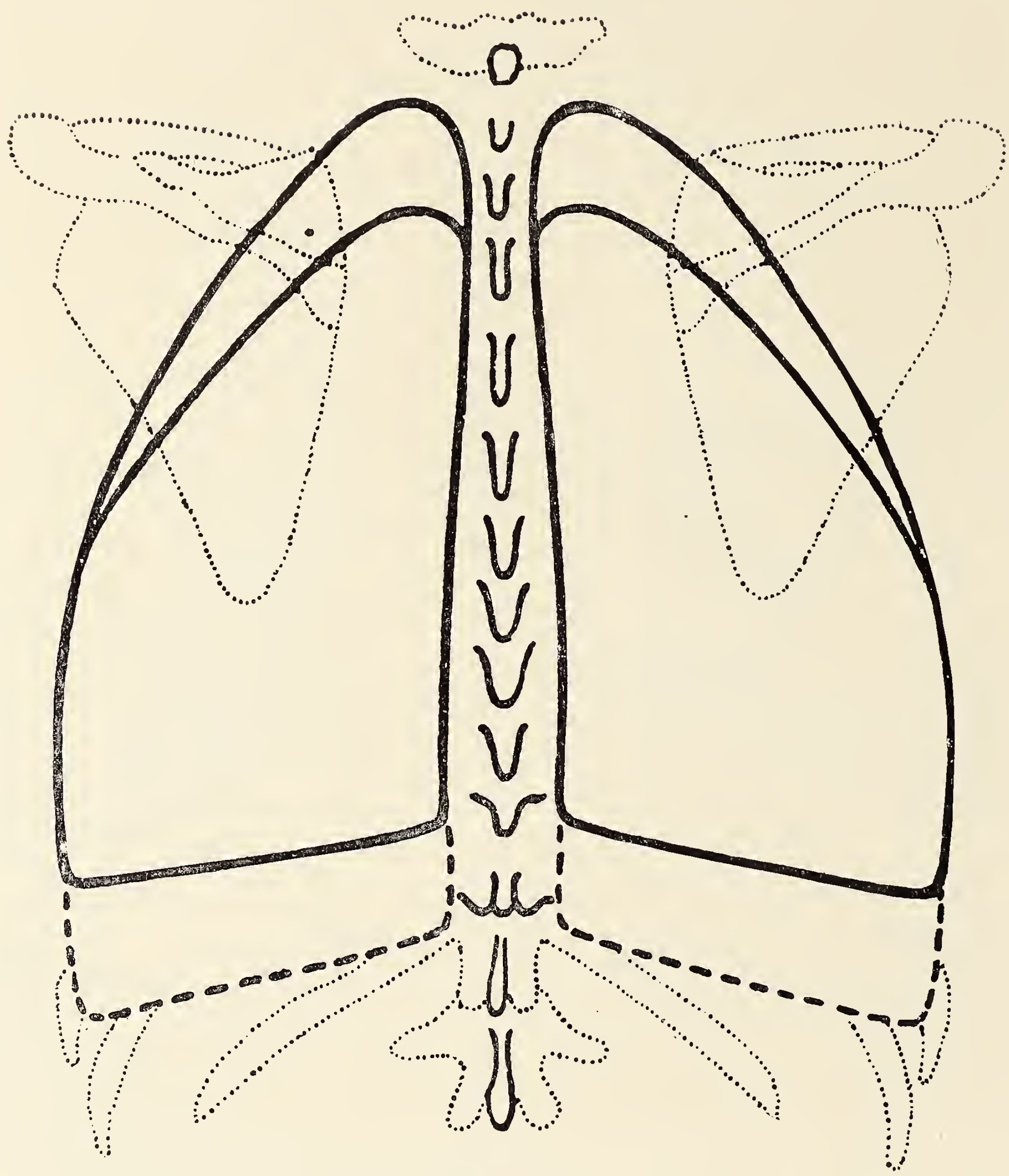
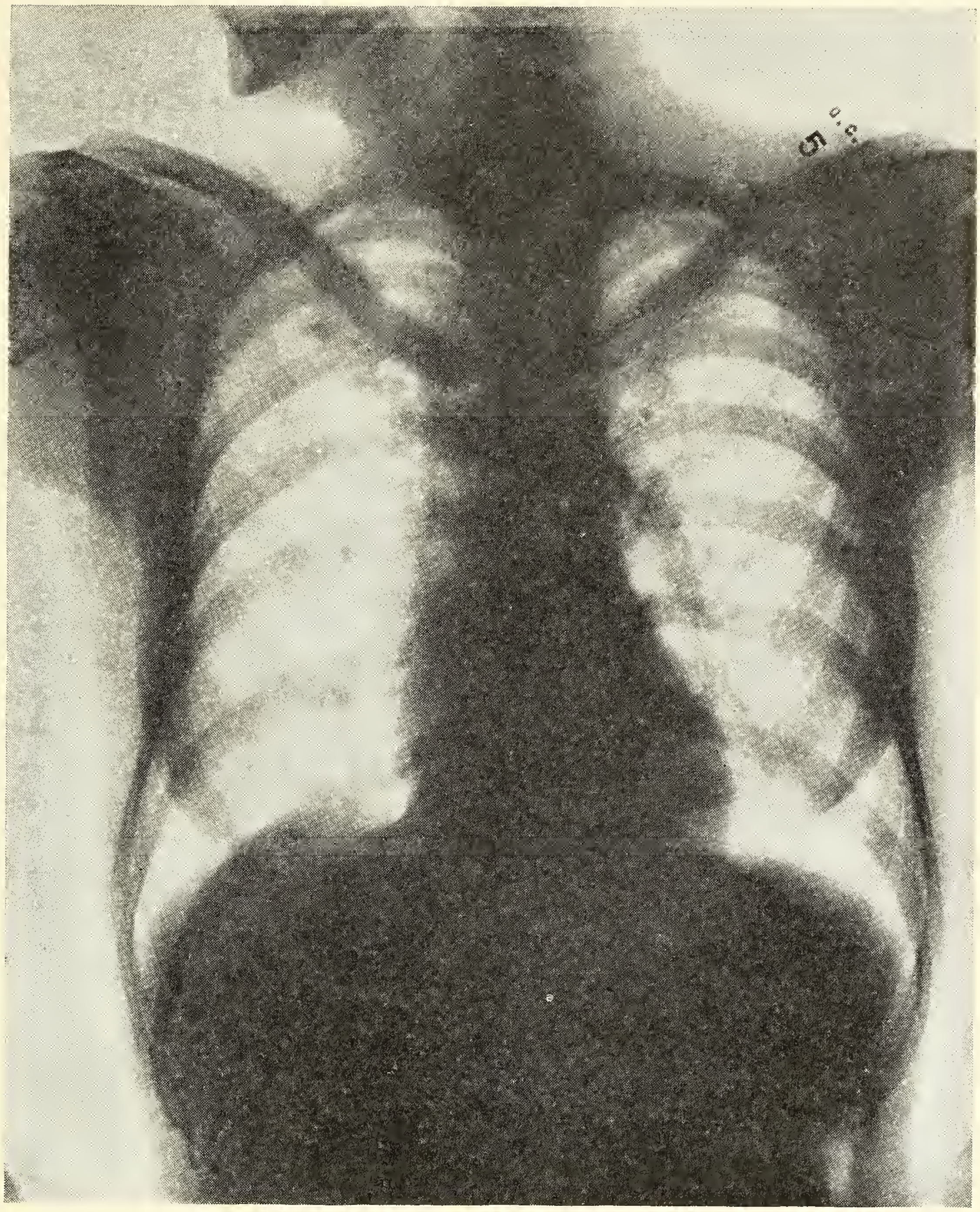


Figure 2

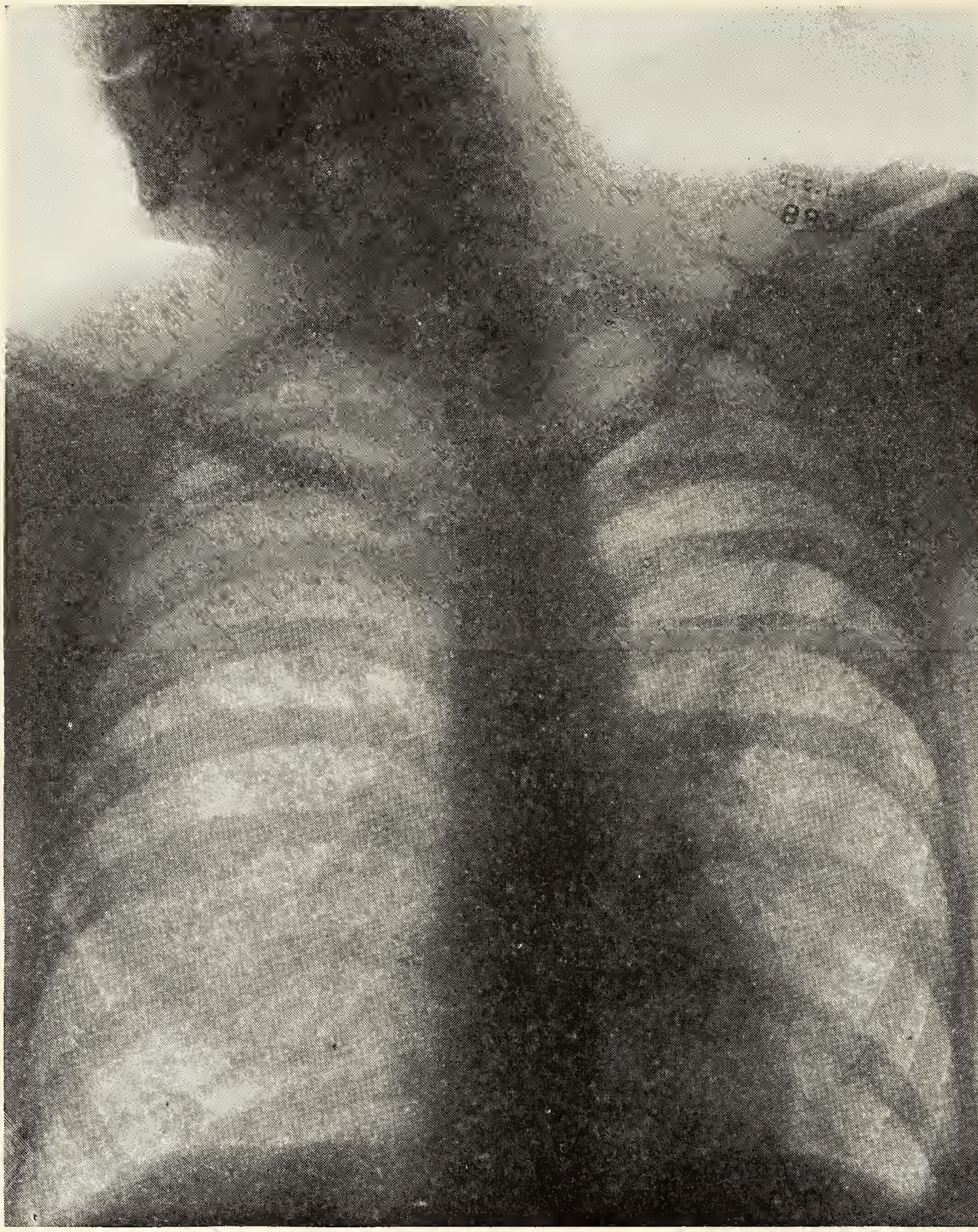
This figure illustrates the approximate location of the lobe on the posterior surface when viewed in the fluroescent screen upright posture. It will be noted that the apex of the lower lobe is approximately the third rib posteriorally or the level of the sterno clavicular articulation anteriorally.



No. 540

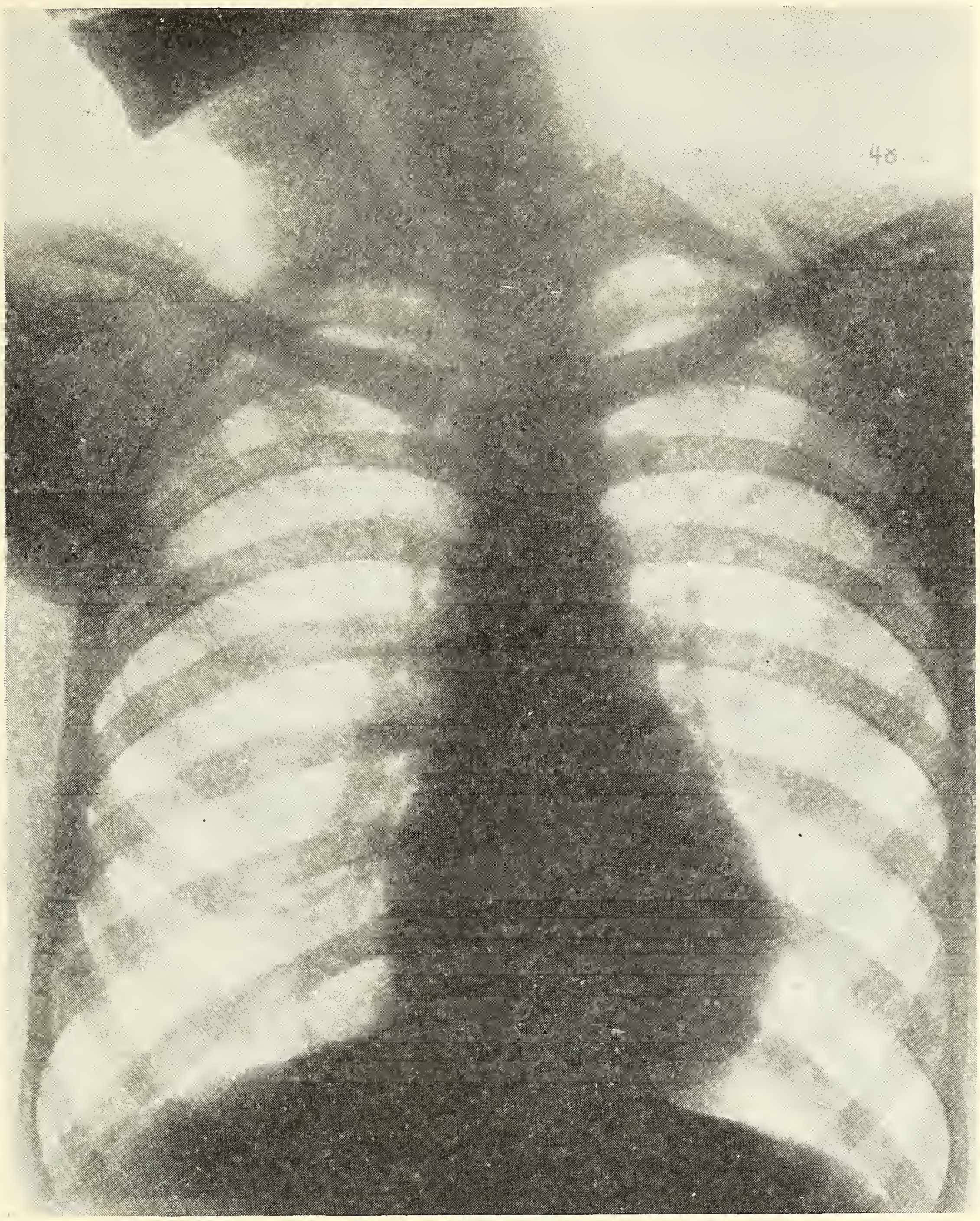
Report from stereo-roentgenogram shows practically negative left lung. Right lung shows a very dense discrete well defined calcific lesion beneath the first interspace mid-clavicular line and deep in the parenchyma below the pleura. Another lesion is noted near the mediastinum in the apical region. It simulates a cone lesion of Dunham. However, very little of the diffuse density can be observed but the outline can be followed by the broncho-parenchymal or linear markings. The conclusions indicate the calcific lesion is probably a healed or inactive lesion. Such calcific masses may indicate the site of the initial lesion of tuberculosis as described by Ghon. The cone lesion is probably quiescent or healed also.

On the left side at the costo-chondral junction of the first rib there is noted a dense irregular deposit of calcium. The stereoscopic view prevents the possibility of confusion between calcium deposits in the cartilage of the ribs and in lung parenchyma.



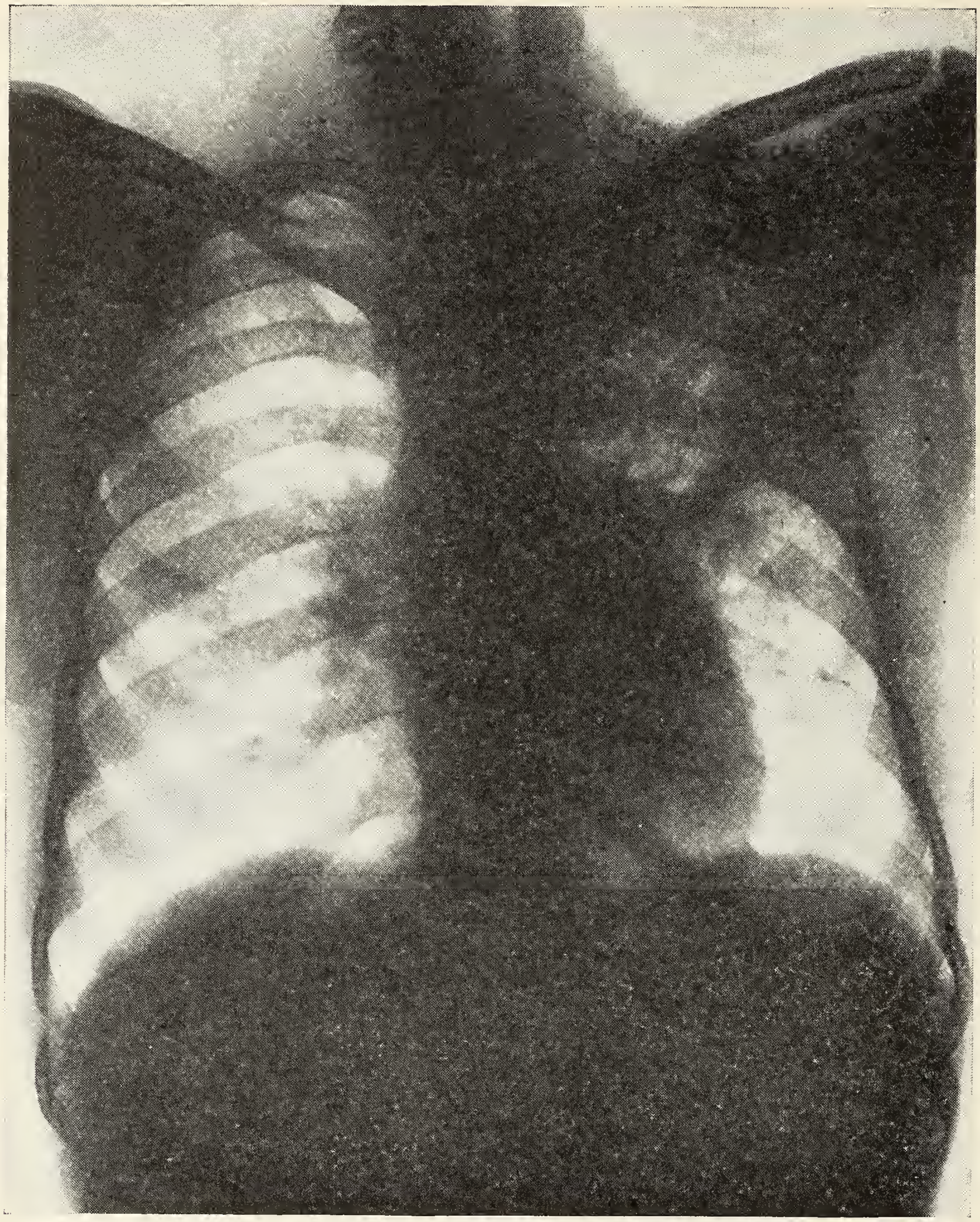
No. 8830

Report from stereo-roentgenogram shows lesions in upper lobe of both lungs. The left lung shows a cone lesion of Dunham behind the first rib and first interspace mid-clavicular line. Another larger and more distinctly defined cone lesion is noted below the second and third interspace axillary region. The apex of this lesion reaches the hilum. There is marked broncho-parenchymal involvement extending upward from the hilum. The conclusions indicate lesions of different ages in the left lung and with the clinical evidence of recent development of severe symptoms, such as night sweats, afternoon fevers and positive sputum along with homogenous diffuse infiltration of a large portion of the upper right lobe, the activity of the process is certain. The prognosis deduced from the findings in this case was decidedly unfavorable.



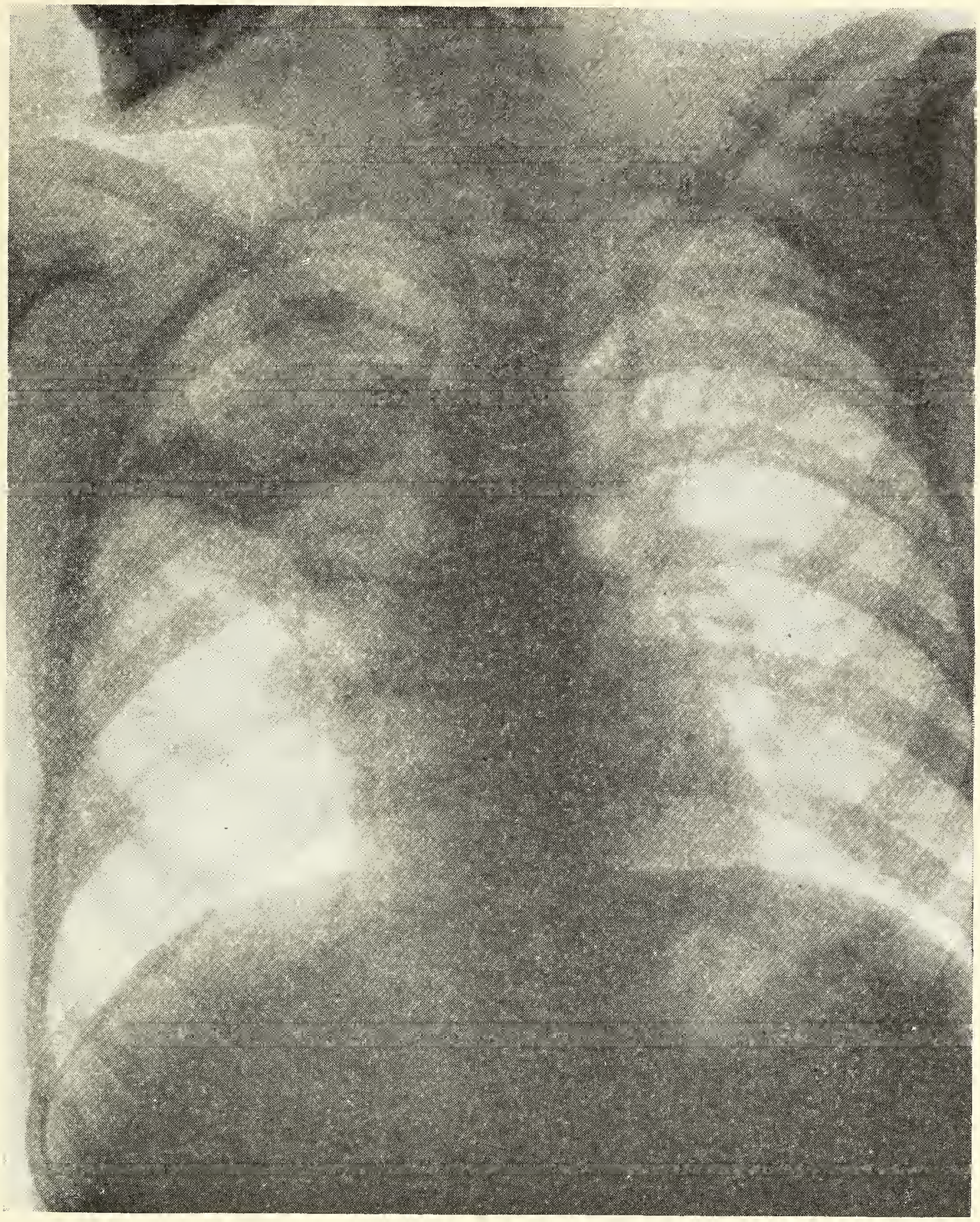
No. 4829

Report from stereo-roentgenogram shows well formed cone lesions of Dunham in upper right lung. Two such lesions show especially distinctly. One with the base to the first interspace mid-clavicular line. The other cone lesion with its base to pleura near posterior border and region of apex of the lower lobe. In the upper lobe of left lung there is evidence of one cone lesion with its base to pleura, second interspace anterior axillary line. Other lesions indicated are diffuse infiltration throughout upper portion of upper lobe right lung. Some broncho-parenchymal involvement.



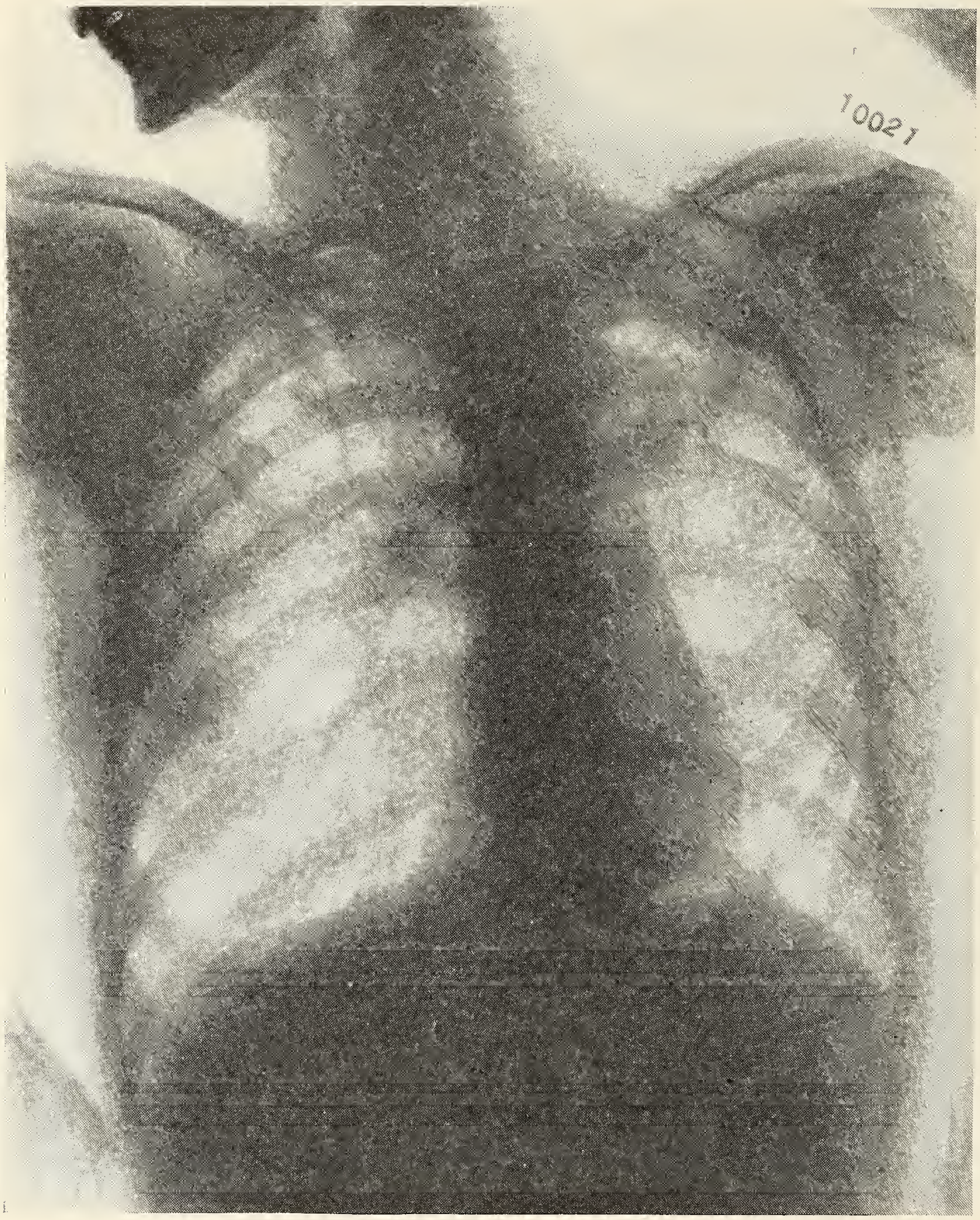
No. X

Report from stereo-roentgenogram shows practically negative right lung. Extensive involvement upper lobe left lung. Evidence of two large cone lesions of Dunham whose bases cover the pleura almost entirely above the first rib and first and second interspace posteriorally. Evidence also of a very large cone lesion with its base over the fourth, fifth and sixth interspaces and between the anterior and posterior axillary lines. Its apex reaches the hilum. The density in these cone lesions indicates areas of consolidation, surrounded by areas of diffuse infiltration. The parenchyma between these lesions show greater or less densities of diffuse infiltration. An interesting feature in this case is noted in connection with the clinical history which states that symptoms referrable to the respiratory tract have been noted for a period of but three weeks.



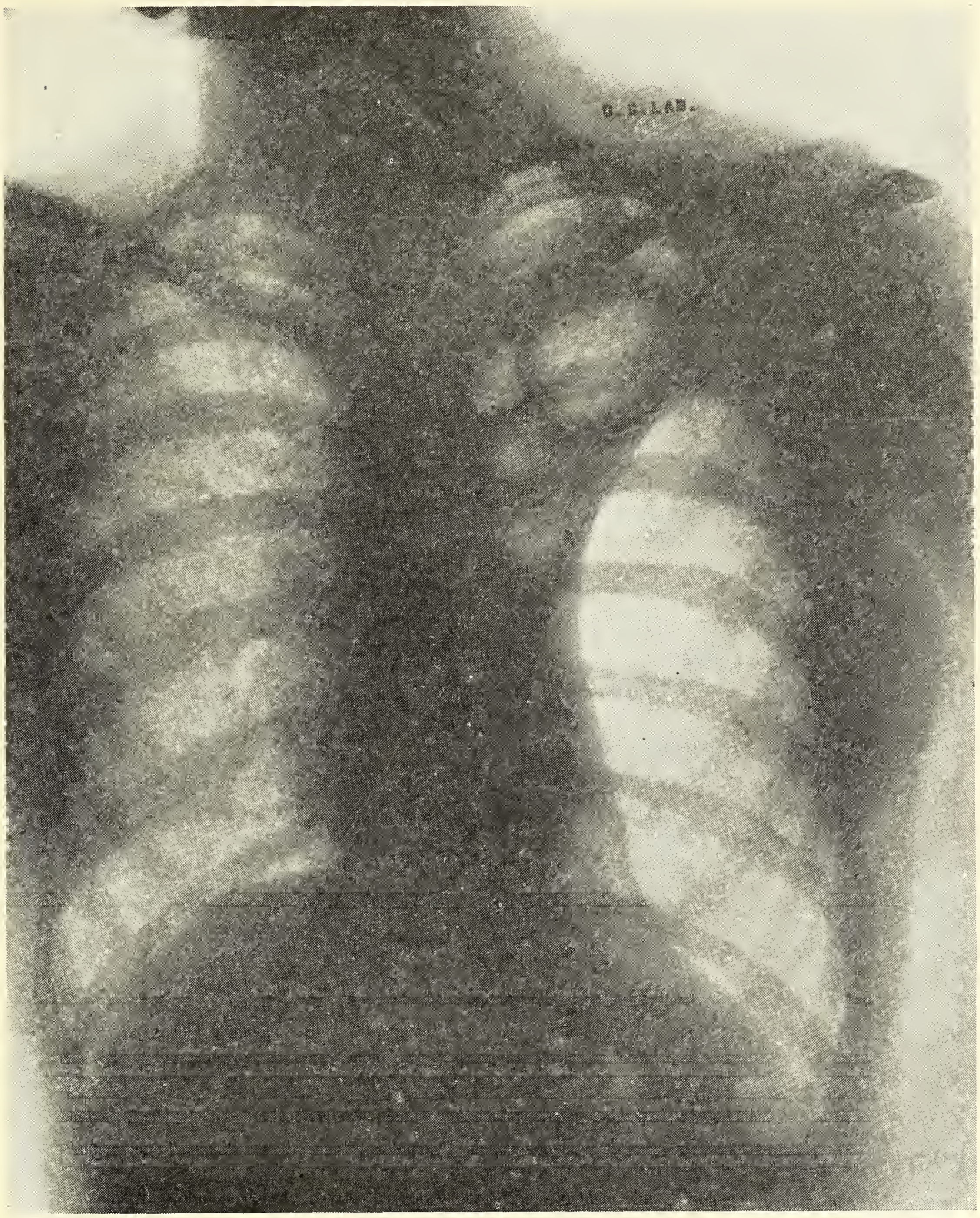
No. 586

Report from stereo-roentgenogram shows extensive involvement upper lobes of both lungs. Fibrosis, consolidation, cavitation and the degenerations are especially marked in the right side. There is dense consolidation along a line extending from the hilus shadow to the pleura at a point suggesting the lower margin of the upper lobe anteriorally. The rest of the upper lobe suggests varying degrees of consolidation and diffuse infiltration, in addition to the degenerations and coalescing cavities. The left lung shows well defined cone lesions in the apical region as well as beneath the first and second interspace mid-clavicular region. The density of the cone lesions indicates different ages. The conclusions in this case warrant a serious prognosis.



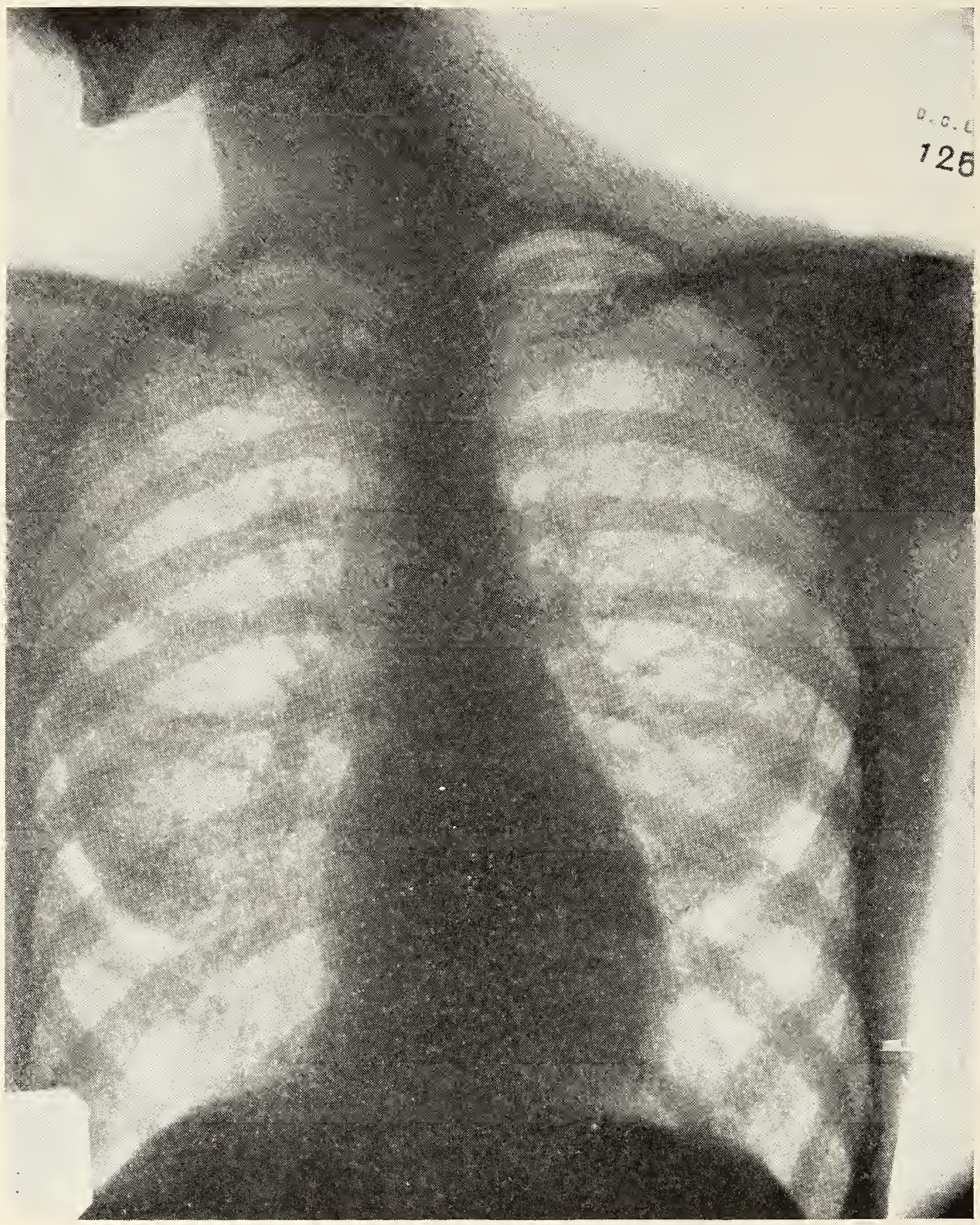
No. 10021

Report from stereo-roentgenogram shows lesions in the upper lobes of both lungs. Extensive fibrosis, cavitation, consolidation, diffuse infiltration, pleural and broncho-parenchymal lesions. There is evidence of caseous and liquefactive degenerations with coalescing cavities. Dense calcific deposits in caseous and consolidated areas are in evidence in the right hilum. Extensive fibrosis with some contraction and displacement of the mediastinum to the left in the upper portion.



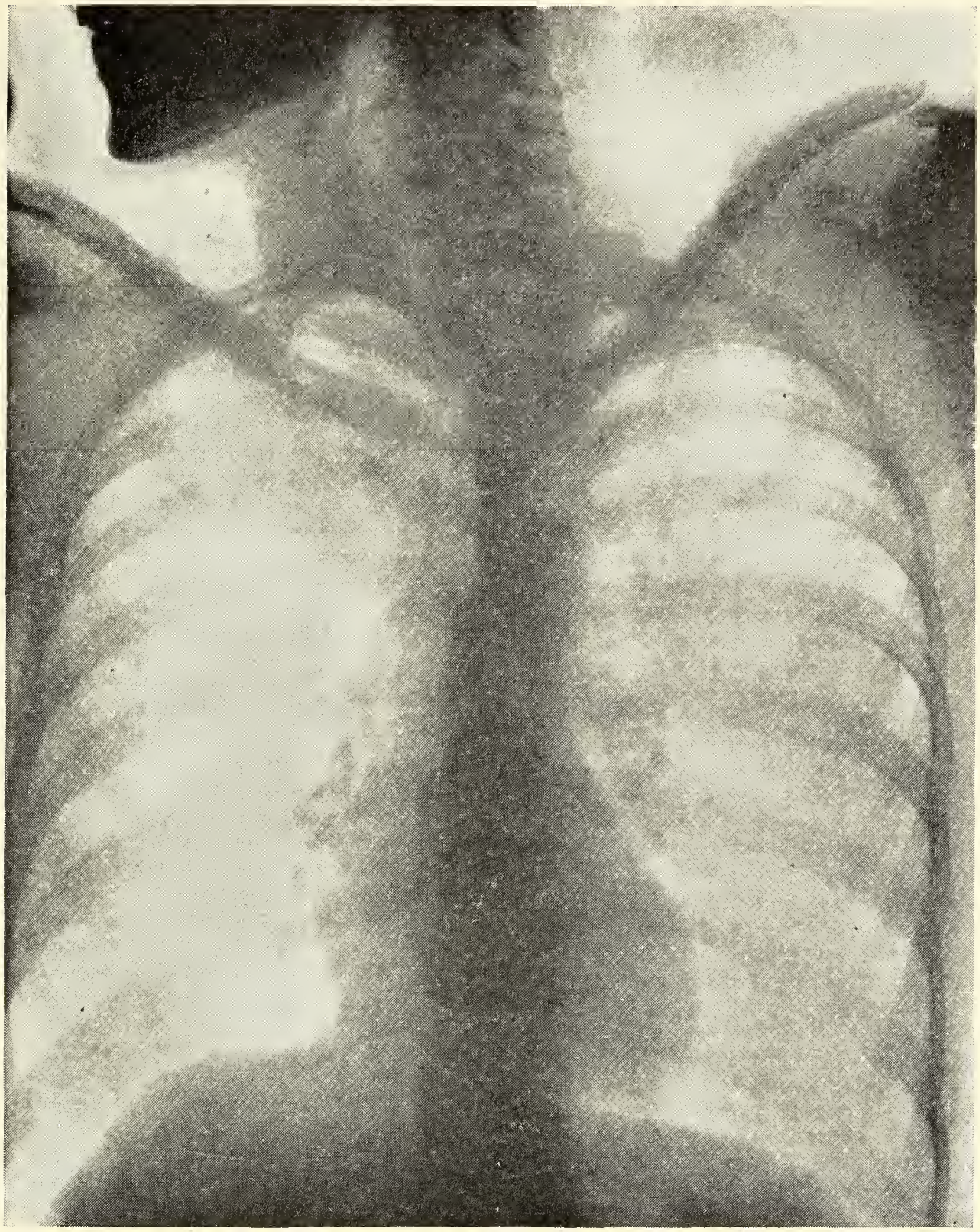
No. 3153

Report of stereo-roentgenogram shows extensive fibrosis, cavitation, pleuro-parenchymal involvement and some diffuse infiltration in upper lobe left lung. Lower lobe of left lung is completely collapsed by pneumothorax. Very little evidence of collapse of upper lobe due to extensive fibrous pleural adhesions which show distinctly in the region of the second interspace beneath the axilla.



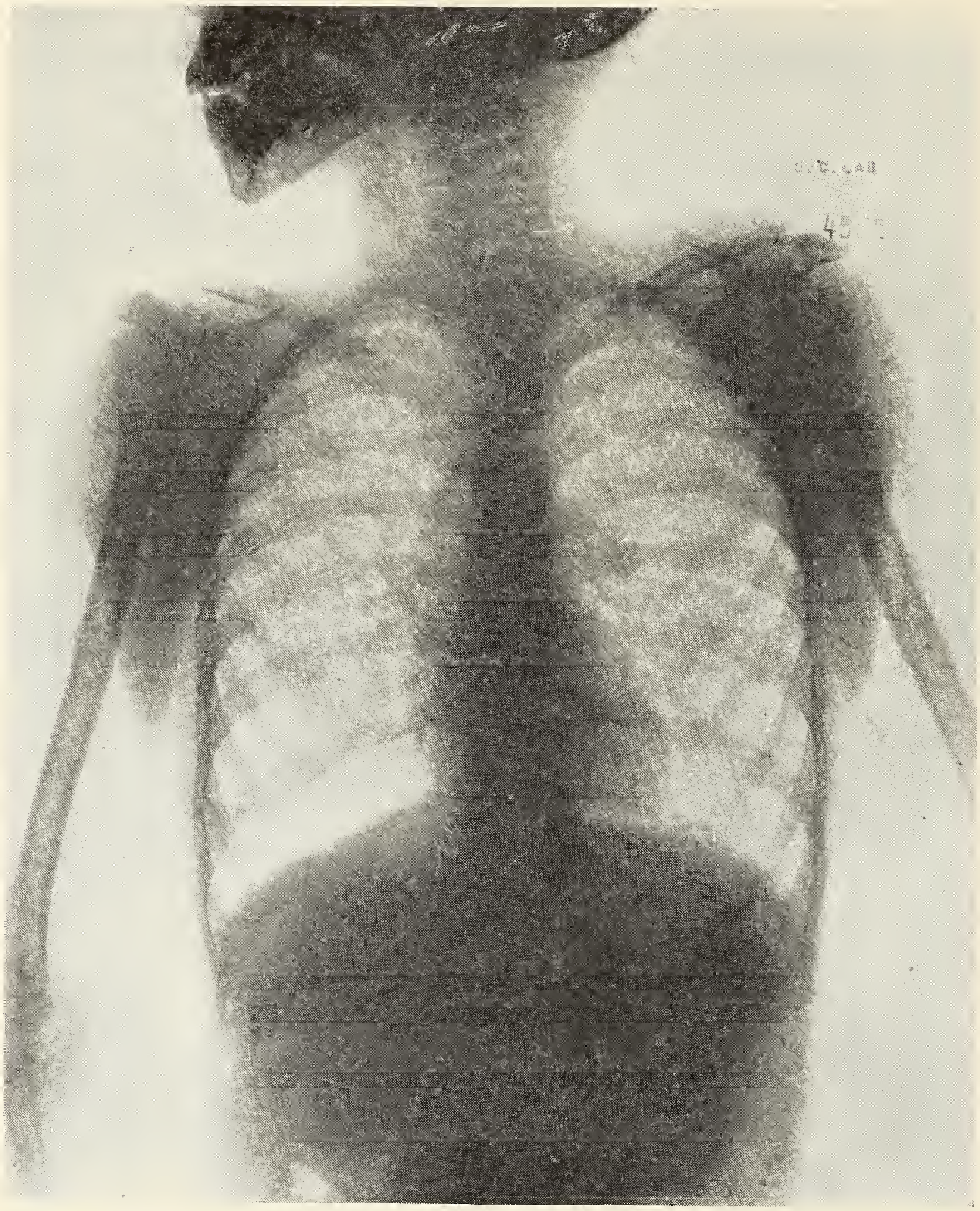
No. 1259

Report from stereo-roentgenogram shows slight broncho-parenchymal involvement, extending upward from the hilus shadow close to the mediastinum and extending well into the apical regions of both lungs. The inverted comma finding pointed out and described by Dr. A. W. Crane is noted very distinctly on the right side. The body of this comma is noted in front of the sixth and seventh ribs posteriorally or behind the third or fourth ribs anteriorally a few centimeters to the right of the spinal vertebra. The curved portion of the comma extends upward parallel to the spine and is lost behind the shadow of the sternum at a level with the sterno clavicular articulation.



No. 722

Report from stereo-roentgenogram shows broncho-parenchymal involvement as the only parenchymal lesion noted. A well defined comma sign of Crane is noted on the right side, overlaying the shadow of the sixth interspace to the right of the mediastinum. The curved portion extending upward and lost in the shadow of the posterior portion of the third rib.



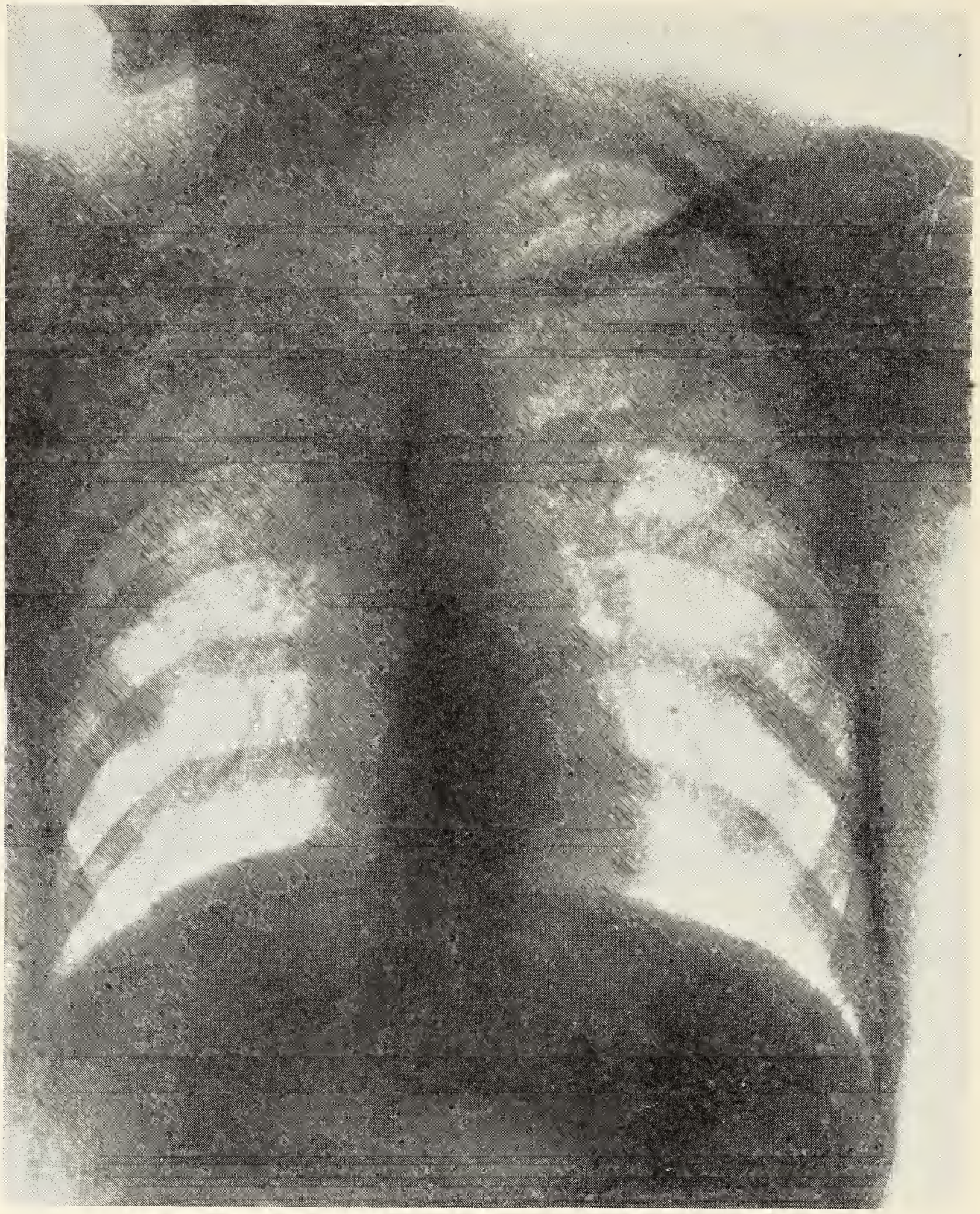
No. 4605

Report from stereo-roentgenograms shows extensive broncho-parenchymal involvement in hilus region gradually disappearing as it extends along the lines of the bronchi in the direction of the pleura. The extensive lymphatic involvement indicated in the clinical history and present in the hilus region suggests this case as an example of Lymphangitis Tuberculosa Ascendens of Albrich. The pleural and marginal parenchymal regions are free from any evidence of lesions.

No. 8352

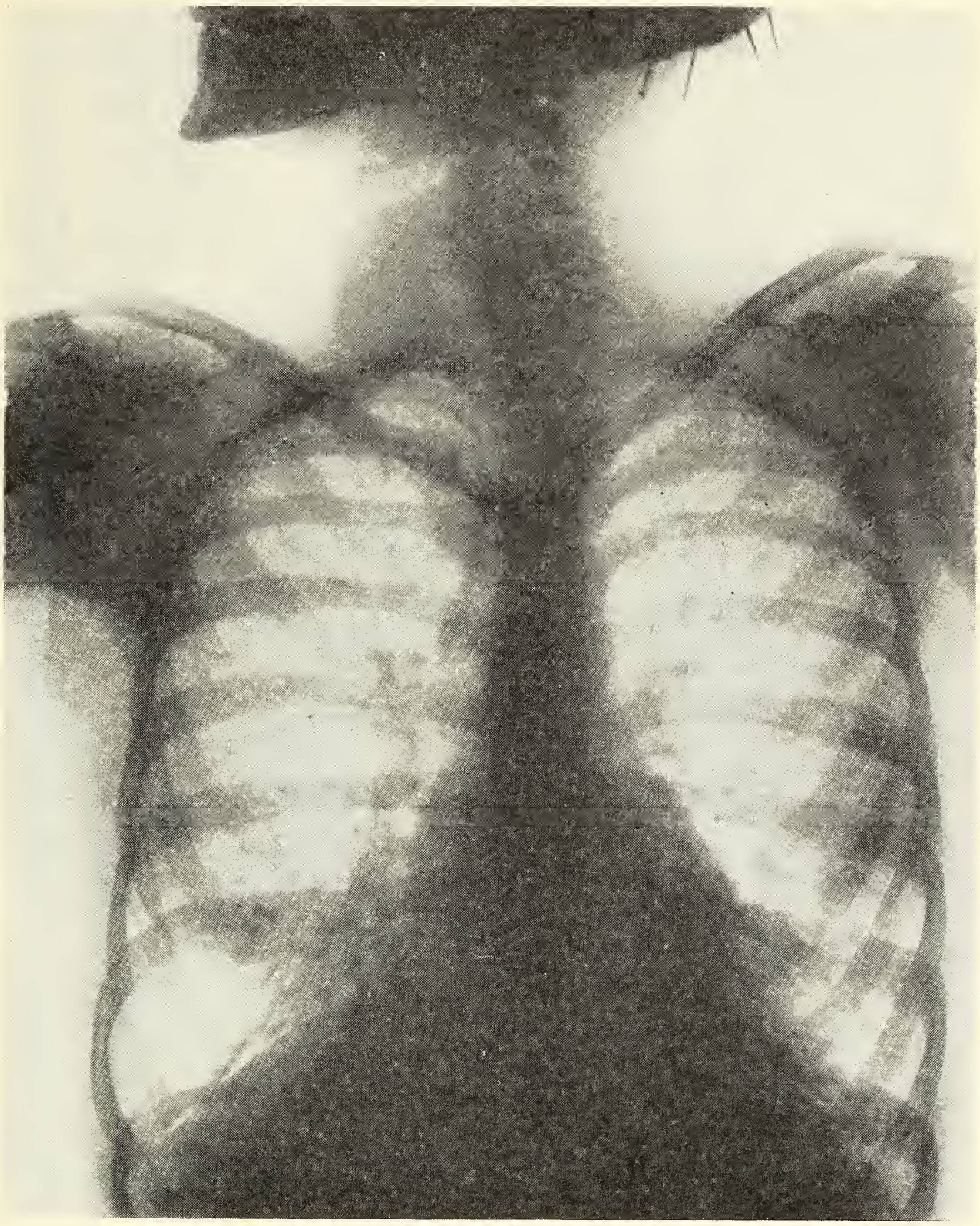
Post mortem pathological diagnosis shows intestinal obstruction, dilated heart, diffuse acute pulmonary edema.

Report from stereo-roentgenogram shows heart greatly enlarged especially in auricular region. Lung shows a general homogenous density not simulating the diffuse infiltration of Tuberculosis.



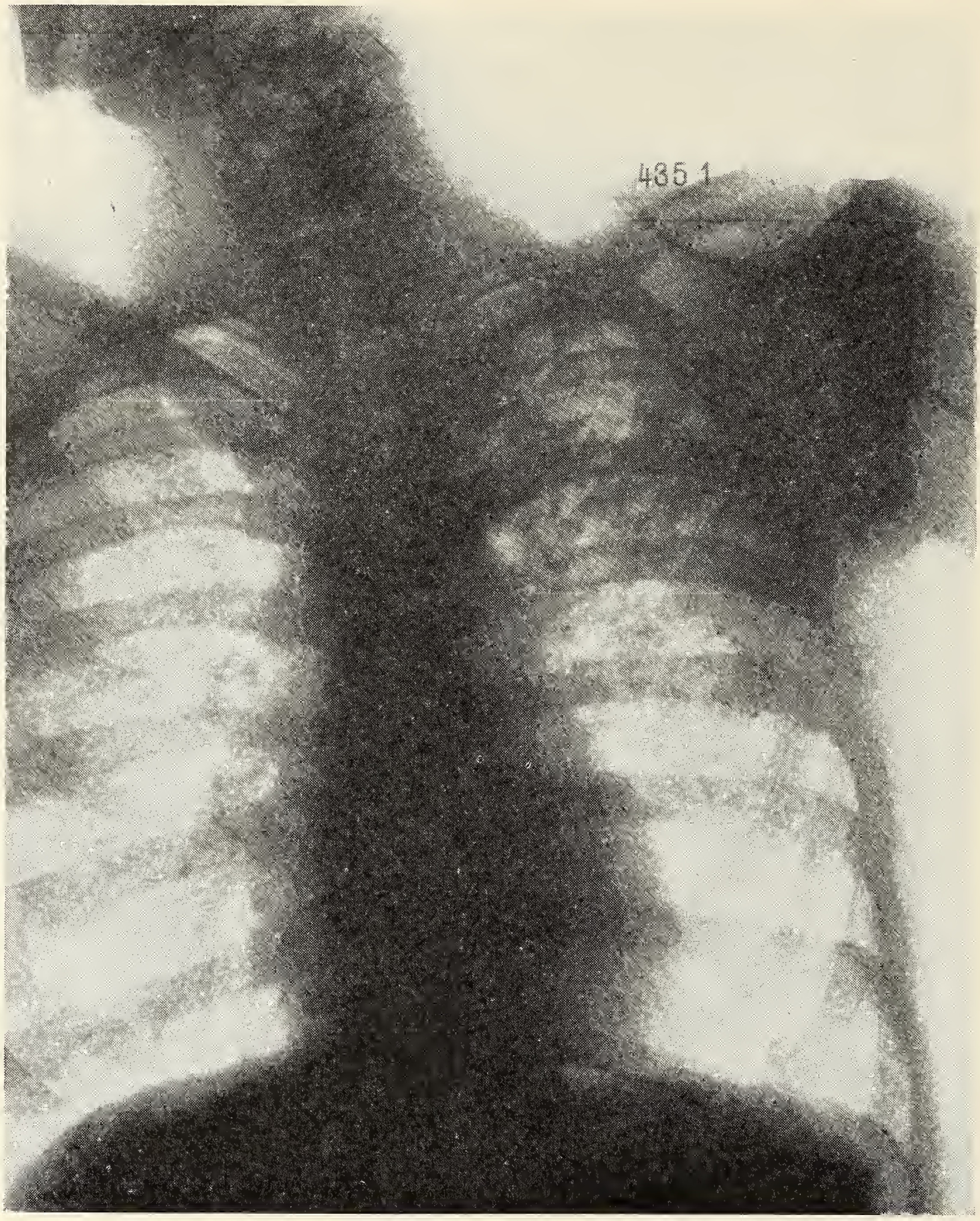
No. 9166

Report from stereo-roentgenograms shows very extensive diffuse infiltration throughout the upper lobes on both sides and somewhat in the middle and lower lobes. The parenchyma is not involved near the diaphragm on either side. Lines of unusual density indicating broncho-parenchymal involvement is observed to extend to the pleural margins throughout the upper lobes. The density in the upper portion of the right lung is almost equal to that of consolidation. It is unusual to find such extensive diffuse infiltration without cavitation or other destructive parenchymal lesions.



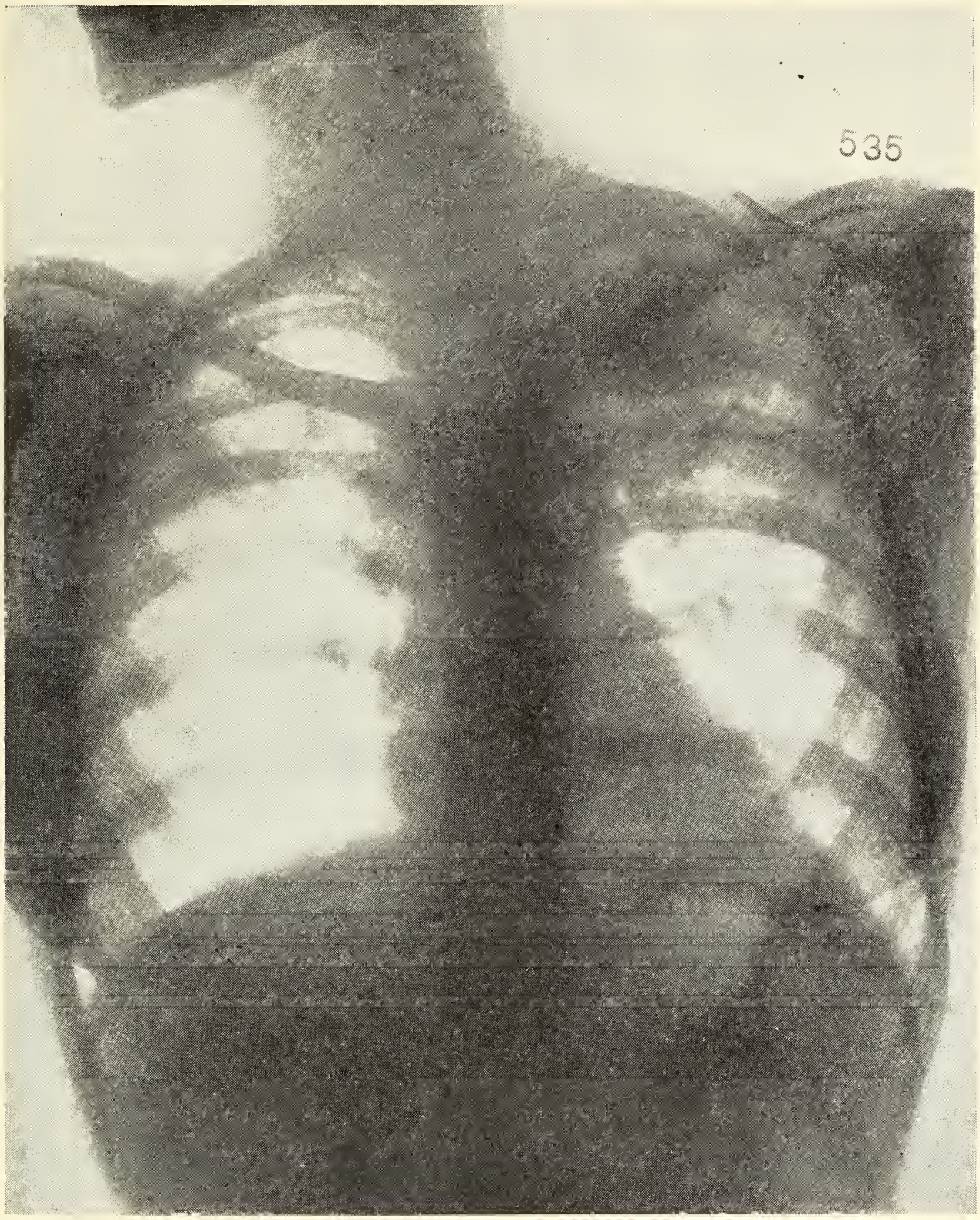
No. 3156

Report from stereo-roentgenograms shows practically negative upper lobe on both sides. The lesions are for the most part broncho-parenchymal and pleuro-parenchymal in character. The pleural involvement is confined entirely to the diaphragmatic pleura. The bronchi show considerable evidence of bronchiectasis. Numerous calcific bodies are observed in the hilus on both sides and deposited along the course of the bronchi, which radiates towards the diaphragm. The inverted comma of Crane shows distinctly.



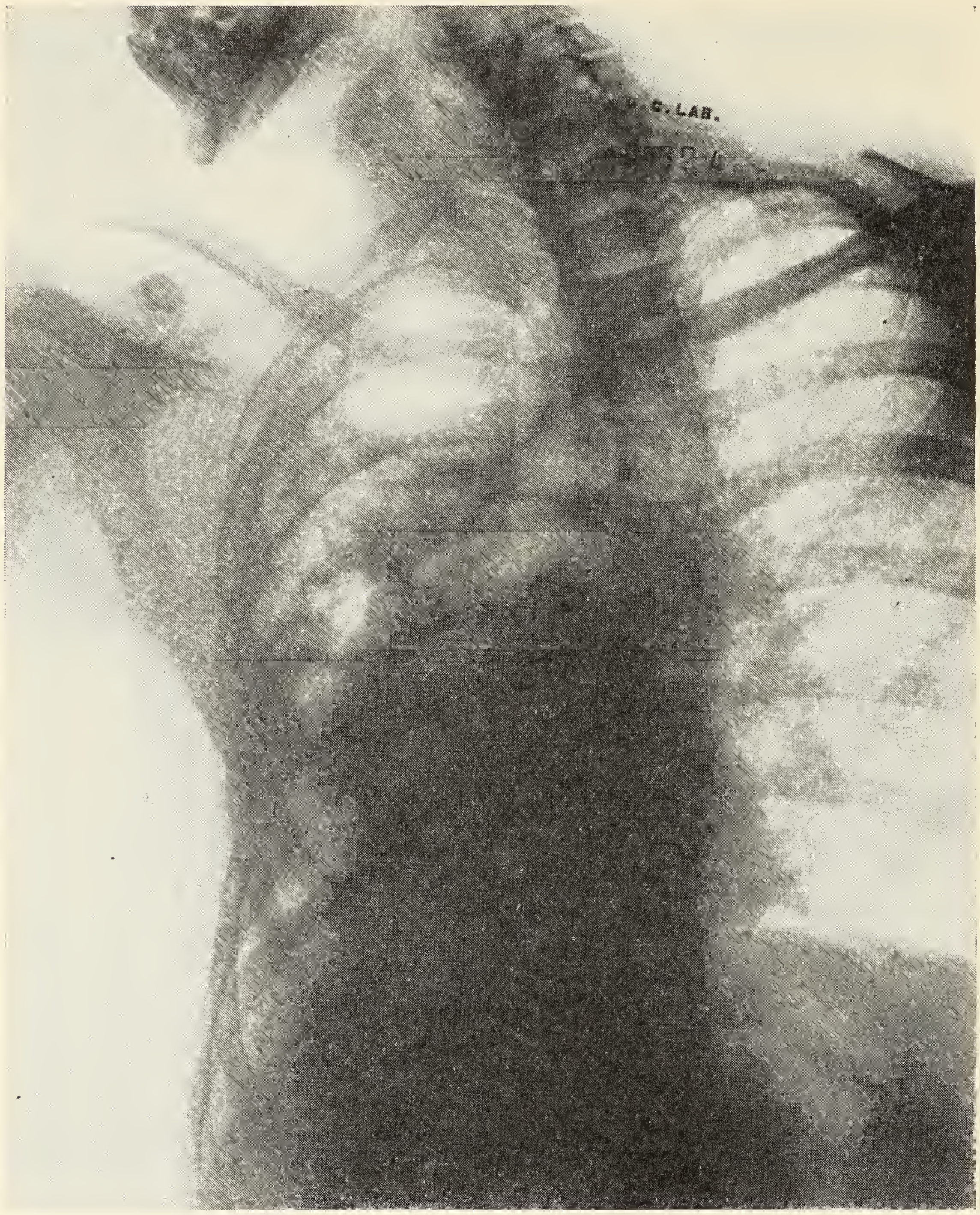
No. 4351

Report from the stereo-roentgenograms shows extensive involvement of the upper lobe on the left side. The lesions present are cavitation, some consolidation, extensive mottled diffuse infiltration almost throughout the upper lobes. There is some pleuro-parenchymal involvement in the apex. Careful observation indicates the diffuse infiltration, which appears to extend so far towards the diaphragm, is confined entirely to the upper lobe. Unusual dense lines in the right hilus compose a complete circle when viewing a single roentgenogram stereoscopically and can be differentiated as in a cavity conclusively.



No. 535

Report from stereo-roentgenograms shows on the right side cone lesion of Dunham in the second interspace mid-axillary line. In the apex above the clavicle a small cone lesion is seen showing less distinctly. Its apex extends but a short distance towards the hilus and it is apparently of more recent origin. On the left side there is extensive pleuro-parenchymal involvement with a large area of almost complete consolidation extending down to the region of the second rib. Below the consolidation diffuse infiltration, which loses density as it extends farther down in the upper lobe. A pericardial effusion shows distinctly and the heart can be outlined within the pericardial sack.



No. 4304

Report from stereo-roentgenograms shows left lung practically negative. Right lung shows very extensive fibrosis, cavitation, consolidation, diffuse infiltration, broncho-parenchymal and pleuro-parenchymal lesions. Pneumothorax is noted in conjunction with collapse of a portion of the upper lobe. The sixth and seventh ribs have been resected at a point near the posterior axillary line. There is an accumulation of fluid at the costo-phrenic angle. The heart and mediastinal structures are much displaced to the right, subsequent to fibrous contraction. The trachea shows very distinctly on the right of the spine and the bifurcation is well marked. The inverted comma of Crane shows indistinctly on the right of the tracheal line.

A PIGMENTED MOLE CASTING THE SHADOW OF A RENAL CALCULUS

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In those cases of renal calculus where the stone is of such a composition that it will cast a roentgen shadow there is really no excuse for not making a "completed diagnosis" with mathematical accuracy. In this class of cases the only thing that would prevent such a diagnosis would be the inability to catheterize the ureter. By a completed diagnosis is meant not only the location of the stone in the upper urinary tract but, also, the determination of its size, and shape; the size and shape of the renal pelvis; the relation of the location of the stone to the renal tissue, the renal pelvis and to the ureter; and, also, the amount of infection present; the amount of destruction of the renal substance; and the functional capacity of the other kidney. With the development of improved roentgen technique, that class of renal calculi where error is allowable is becoming rather small. Even in these cases the employment of the wax tipped ureteral catheter cuts the possible error still smaller.

In the University Hospital at Iowa City the Genito-Urinary service follows the routine given below in practically every case of renal disease: A complete history and physical examination; complete urinary examination,—especially of the urinary sediment; blood findings; roentgenograms of both kidneys, both ureters and the bladder; cystoscopy and ureteral catheterization, using X-ray catheters; analysis of the segregated urines; functional tests of each kidney; roentgenograms of the suspected side with the cath-

eter in place; and pyelography. If one will follow the above routine, keeping in mind the possible things that may lead to error and, also, being sure that the findings of each step fit in with the findings of the other steps, there will be little chance for mistakes.

The case to be reported illustrates very nicely one of the more rare conditions that lead to error and, also, the fact that if one does not make all the findings fit together he will be misled.

Mrs. S, Number 28,418, a housewife, sixty-five years of age, and fairly well preserved. The patient entered the hospital complaining of bladder symptoms, with some pain in the right lumbar region. Briefly, her history shows that about two and one-half years ago, or in the fall of 1916, she first noticed the bladder symptoms of burning, smarting and frequency. A little later she had, besides these symptoms, sharp shooting pains in the region of bladder, which she thought were located more on the right side than on the left. The attack and the symptoms lasted for a period of weeks and then disappeared. She had no serious trouble from that time until her entrance to the University Hospital, except for very mild attacks of frequency and burning, together with rather indefinite pain in the right lumbar region. In August, 1918, there appeared very suddenly severe symptoms of frequency and burning and sharp pains in the bladder together with rather intense pain in the right abdomen. This pain in the right abdomen was not, and never was, typically that of a renal stone.

At the time of her admission to the hospital she had some tenderness over the bladder and in the region of the right kidney. The urine was loaded with pus and numerous motile bacteria. The blood findings were practically negative.

Both kidneys and ureters and bladder were X-rayed and the plates of the right kidney, which is shown as Figure I, showed a definite shadow about a centimeter in diam-

eter, exactly in the region of the right kidney. From this a diagnosis of stone in the right kidney was made.

The cystoscopic examination showed a bladder about normal, except for some inflammatory changes around the neck and also edema and redness around the orifice of the right ureter. Both ureters were easily catheterized with No. 6 X-ray catheters. The urine from the left kidney was negative. The urine from the right kidney showed large numbers of pus cells and many motile bacilli. The functional capacities of the two kidneys were equal.

A roentgenogram was made of the right kidney, with X-ray catheter in place as is shown in Figure II. It will be noted that the shadow that was thought to be a stone is in exact contact with the shadow of the tip of the right catheter. Next, a pyelography was done, by filling the right renal pelvis with fifteen per cent thorium solution. Two plates were made and are illustrated in Figures III and IV. It will be seen, from these, that the pelvis is somewhat dilated and a trifle irregular; and it will also be noted that in each of these plates the shadow of the apparent stone is not in the same location in relation to the tip of the catheter. It will also be seen that the tip of the catheter is at the upper extremity of the upper major calyx. In Figure III the apparent stone is about half a centimeter away from the tip of the catheter; and in IV it is fully a centimeter away from the tip of the catheter; whereas, according to Figure II the stone shadow should be exactly in the upper major calyx.

It was just this last mentioned point that made us doubt the accuracy of our diagnosis. In other words the findings of our pyelography did not fit in with the roentgen findings of the catheter in the ureter.

In examining the patient's back there was found a pigmented mole in the right lumbar region. It was about one centimeter in diameter. In order to determine whether or not it was this mole that cast the shadow, we fastened a

marker over its center and made two exposures at different angles. These are shown in Figures V and VI, and they both show the marker exactly in the center of the shadow that we had mistaken for a renal calculus.

The diagnosis was therefore changed from that of renal calculus to that of a right pyelitis, and under treatment the patient has responded very well.

Fig. I

Fig. II

Fig. III

Fig. IV

Fig. V

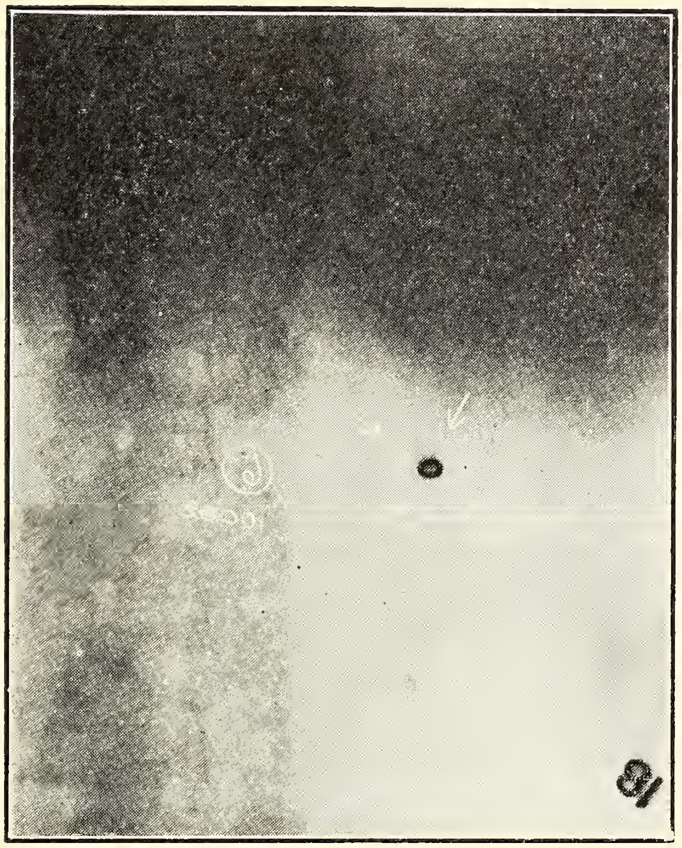

Fig. VI

CLUB HAND DEFORMITY IN THE ROENTGENOGRAM

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On the basis of Kirmisson's definition of club hand as any permanent deviation of the hand to the forearm, the classification of Lodi distinguishes dorsal and palmar flexion, radial or ulnar abduction: talipomanus flexa vara or valga, talipomanus extensa vara or valga. But for practical purposes it is much better to adopt Whitman's distinction of cases of distortion by abnormal restraint and pressure in utero, and cases of deformity associated with defective development of radius and ulna. Of the latter class the vast majority show deviation to the radial side, due to partial or total defect of the radius. Of 114 cases reported by Antonelli, 56 were unilateral and the rest bilateral cases. Absence of the radius was observed in 44 cases. Absence of the radius is therefore the most important single feature in congenital club hand deformities.

Although ulnar deviation is not very uncommon among congenital club hand deformities, actual defect of the ulna is extremely rare. Only one case is mentioned by Stoffel in a very thorough study of the subject.

In cases of partial or total defect of the radius the first metacarpal and the phalanges of the thumb are also often missing and the hand if often, not only in radial abduction, but also in pronation and palmar flexion.

In cases without defect of the radius, while the thumb and its metacarpal are present, very often one or more of the extensors of the long abductors of the thumb are missing. In cases of defect of the radius not only these but also

the flexor carpi radialis and extensor carpi radialis are missing in about 50% of the cases.

In this report of seven cases the roentgenological findings shall be considered mainly.

Case 1. K. M. 5 months. Full term child. Instrumental delivery. Otherwise healthy normal babe. Examination shows both hands in club hand position with extreme radial abduction and palmar flexion of the hand. Both thumbs are missing. There is a scar over the tip of the fibula. The radius is nowhere palpable. The ulna is intact and shows a sharp curve of the lower end with outward convexity.

A study of the roentgenogram shows the following:

The radius is entirely missing. The first metacarpal and phalanges of the thumb are also missing. There is a sharp curve at the lower end of the ulna which forces the hand into radial abduction to the degree of contact between the radial side of the hand and forearm. Of the different bones of the carpus none is throwing a shadow except for a small shadow in the os capitatum. The pictures of both hands are identical.

In this case the deformity of the forearm was improved by forcible infraction of the ulna and straightening of the hand.

Stoffel and Stampel, who have made an anatomical study of club hand, state that there is no articulation between the ulna and carpus, but merely fibrous junction between whatever carpal bones are present and the lower end of the ulna. Of the carpal bones, the scaphoid and trapezeum are most often missing, while the capitatum, uncinatum and triquetrum, as a rule, are present.

From the shadows of the musculature in the picture it appears that in this case the long radial muscles of the wrist, that is, the flexor carpi ulnaris and radialis and the long muscles of the thumb are absent or rudimentary, al-

though no positive proof can be induced in absence of anatomical investigations. (Figure 1.)

Case 2. E. T. 6 months. Natural birth. There has been a similar deformity of the hand in the mother's family.

The bilateral deformity is that of a club hand with ulnar abduction, in the left hand associated with webbing of the second, third and fourth fingers. The thumb is preserved. There are also extension contractures of both elbows and adduction contraction of both shoulders.

The roentgenogram shows the radius and ulna normally developed. The carpal bones did not show at the age of one and one-half years, although at that time several bony ossification centers should be indicated. The hand is held in ulnar abduction. The musculature of the ulnar side is distinctly visible, and not missing, as in the first case. There is, however, in this case no gross disturbance in the development of the bony skeleton and the inference, naturally, is, that this case is of a different etiology. (Figure 2.)

It is quite probable that external influences in utero had something to do with the development of the deformity, while the first case is evidently one of primary variation.

Case 3. C. M. 11 months. Congenital club hands and club feet. The condition is similar to the preceding case. The deformity is also associated with flexion contraction of both knees and hips, and with extension in elbows and adduction in the shoulder joints. The hands are more nearly in palmar flexion without lateral deviation and the flexor tendons are considerably contracted. In this case the left thigh showed a deep groove almost to the bone caused by constriction of the cord. The baby was born full term as one of a pair of twins, the other twin being apparently normal. The cord was twisted around the thigh and the hands were flexed clear back against the wrist. In this case influence of external forces in utero is even more evident than in case 2.

Case 4. G. H. 6 years. Normal term. Rigidity of the

muscles noticed at birth. This boy had never walked, but used his hands for locomotion. In this case there are many evidences of impeded development, such as high palatal arches, pigeon chest, etc.

The roentgenogram shows the following:

There is perfectly normal development of the radius and ulna. The metacarpal of the thumb is very short, being less than one-half of the metacarpal of the index finger. The thumb stands off the palm of the hand at right angles more like an appendix although motion of the thumb seems to be entirely normal. (Figure 3.)

In cases 3 and 4 and possibly 2 we have contractures rather than deformities. There are no gross lesions of the skeleton, barring certain retardations which go hand in hand with the functional disability of the extremities. Also, we note that there is a general involvement of all the joints of the extremities. These cases I believe to be entirely postural.

Case 5. R. G. 8 years. This case was evidently one of acquired club hand deformity, though the history left some doubt in regard to this point. In this case the right hand only was involved. The fingers of the hand are well developed except for the thumb which is entirely missing and only substituted by a little appendix one-half inch long, containing a rudiment of the first metacarpal. The muscles of the thumb, however, are quite well preserved, especially those of the thenar.

The roentgenogram shows the lower end of the radius has been destroyed in its radial half, leaving only a long spur at the ulnar border of the bone. The bones of the carpus are well developed with the exception of the fact, already mentioned, that there is only a rudiment of the first metacarpal. The ulna bulges forward bowing outwardly and adding considerable to the club hand deformity. (Figure 4.)

The inference from the parent's statement was that the condition was congenital or existing from early infancy. The fact, however, that there is almost total defect of the thumb without any disturbance in the development of the carpal bones nor any defect in the musuclature of the thumb, points out strongly that this was an acquired deformity. The scar on the radial side is added evidence, though not an absolute one, because we find amniotic scars in congenital cases. (See case 1.)

This case was improved by osteoplastic method and formation of a new thumb taken from a rib.

In this connection I would like to mention another case of acquired club hand deformity.

Case 6. L. S. 14 years. In infancy the patient was taken sick with high fever and acute pain in the forearm resulting in formation of sinuses and sequestration of bone, which resulted in a club hand deformity, in which the right forearm remained four or five inches shorter than the left. The hand is forced in abduction by the curve in the lower end of the ulna. The motility of the hand is apparently intact.

The roentgenogram shows the following condition:

The radius is almost entirely gone with the exception of one inch of the proximal end and about three-fourths of an inch of the distal end of the bone. The ulna has subsequently grown past the distal end of the radius. The carpal bones are intact.

This case was treated by bone graft methods. (Figure 5.)

The acquired nature of the deformity is beyond doubt in this case.

Case 7. E. D. 2 years. The patient is a colored baby, 2 years old, with decided club hand deformity, especially noticeable in palmar flexion and adduction of the hand. On examination it is found that the deformity is due mainly to rachitic bend in the lower end of the radius. There are

many other evidences of rickets of the extremities as well as the head and thorax.

Roentgenographic examination shows the cupping of the epiphyses, characteristic of rickets, and the ulna shows an outward bend, which produces radial adduction of the hand. Several of the carpal bones show distinct bony shadows. The metacarpals seem to be normal except for a very short first metacarpal. (Figure 6.)

I am mentioning the last case merely to complete this small series of club hand deformities, showing under similar clinical pictures such widely divergent etiological conditions.

While there are four cases of congenital bilateral club hand deformities, only case 1 is undoubtedly one of primary variation in the embryonal development. The three others, I believe, to be due to external condition in utero, chord constriction, postural anomalies, etc. Of the three acquired cases two are of osteomylitic origin, resulting in partial defect of the radius, and in one case of the thumb. The last case is entirely rachitic.

FIGURE 1

FIGURE 2

FIGURE 3

FIGURE 4

FIGURE 5

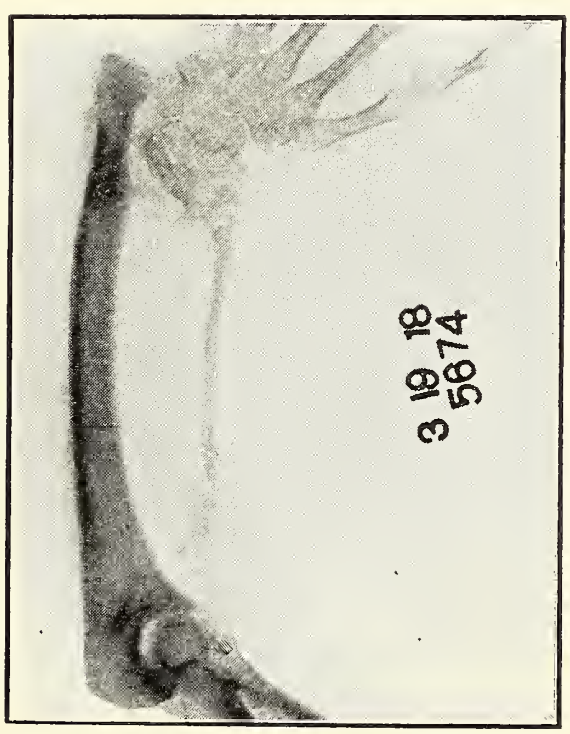

FIGURE 6

SOME REMARKS ON CHEST ROENTGENOGRAMS

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It is not my intention at this time to give anything like a complete discussion of any of the chest diseases, but rather to merely touch upon a few of the points in the diagnosis of certain conditions. Neither will I try to give a classical paper by any means, but just a few disconnected remarks.

There has been much written concerning the Roentgen findings in tubercular lung disease; the same might be said concerning the other chest diseases. This statement has been very well emphasized by the very elegant and instructive papers of Drs. Orndoff and Wallace to which we have just listened.

Now, I may not be able to give you anything new, but a sort of a review and a touching up on certain things may help some of us, and I hope that we may feel that the time has not been wasted.

I think that today one of the greatest hindrances to our work is the fact that the internist and surgeon do not believe what we tell them in regard to certain cases. Where is the reason for this? Is it our fault or theirs?

There is an element of ignorance entering into the case somewhere.

It is a fact that men following along one line of work nearly always in a short time get to seeing things from their standpoint only. Nowhere is this better seen than in the work of the Roentgenologist. He of all medical men really does "see things" and unless he keeps a good hold on himself and continually checks up his work by careful physical examination, postmortem and operating room work, and by

consultation with surgeons and internists, he is very apt to become locoed, or at least appear so to the balance of the profession. I think that every Roentgen operator should make a practice of attending every operation and every postmortem that he possibly can.

In talking to one of our brightest diagnosticians a few days ago, he offered the assertion that there is no condition within the chest as shown by the Roentgen ray that cannot be accurately diagnosed by a good internist by physical examination and consideration of the history. If that is a fact, then it stands to reason that there are either a great many internists who are poor diagnosticians or else the Roentgenologists are seeing things for sure, for it is an everyday occurrence for the Roentgenologists to pick up the internists on mistaken diagnoses.

This is not as it should be and it seems to me that the Roentgenologists should somehow get into a better understanding with the balance of the profession so that the greatest good may be accomplished.

Are we making mistakes in our work? If we are, let us get busy and make fewer of them. Let us give more attention to physical examination, and it is perfectly easy to get the history completely during an examination without provoking comment at all. Let us make the physical findings and the Roentgen findings agree. Unless they agree there is a mistake somewhere. And they must fit in with the history of the case. An increased density appearing on the Roentgen plate must mean a change in the physical findings. Let us find them.

I know that most Roentgenologists are very busy men and that it takes time to make careful physical examinations, and attend operations and postmortems, but it is a sure thing that the men who are doing this most are doing the best work, be it abdomen, chest, extremity or head. The Roentgenologist sees things on the Roentgen plates, the surgeon sees them and feels them. Each has a certain

knowledge of the case, and the knowledge of both is to be taken together if we are to do the best work with the least possibility of making mistakes.

Likewise in treatment, the surgeon cuts it out and the patient drifts from view. If the growth returns the patient probably goes to someone else and the first surgeon never sees him again. The Roentgenologist will shrink a growth until it finally disappears, but the surgeon does not see this and won't believe him when you tell him of the result.

The only solution to these problems is the getting together of the Roentgenologist and the internist or surgeon as the case may be. In other words, team work is what is necessary. If a closer relationship could be established between these men, you would not see so many internists and surgeons putting in their own machines to the detriment of the profession and the harm to the patients. But can you blame him very much?

We know that with the time and experience that it takes to do good work, that no busy internist or surgeon is going to do good Roentgen work, but the point is, he can see things his own way. To us as a profession, it seems that we are drifting farther apart.

The danger to the profession is, that poor work in this line such as a busy internist or surgeon will do, will lead to a still further neglect of the positive good that comes from exact and first-class Roentgen work.

I have one man who has me do a lot of abdominal work for him, and he pays no attention to what I find, and is very frank to tell me so. He says there is nothing to it. He merely has the work done so as to appear to be doing up-to-date work. He is not a fool by any means, he is only on the wrong track. What would you do with him?

Much of what I have been saying probably applies with greater force to abdominal cases than to chest cases, but we find the same conditions here to a great extent.

I will show you a few slides to illustrate some of the

things I have been speaking about, and while they are just the ordinary run of conditions that we deal with all the time, still, we may some of us pick up a few points from the review.

No. 1. The trouble in this case dates back something like three or four months. The man at that time began to notice that he was a little short of breath. This gradually increased. His family physician treated him for several weeks, but he gradually kept getting more short of breath. He was finally brought to a hospital in this city and a surgeon consulted. As the man at this time was very sick, the surgeon called in a throat specialist to see if he could find the cause of the dyspnoea. The throat man could find no cause for the difficulty in breathing, but did find a ragged epiglottis and clipped off some of it for microscopical examination. But the poor man could not breathe. They then happened to think of the Roentgenologist. I was called in consultation. Here was what was found—a simple case of pleural effusion. Such a simple case that I am almost ashamed to show it to you, but it just illustrates what I have been saying, that men following along a certain line of work forget that they are physicians in the broad sense of the word, and just work along one line and see things only from that angle. Now these three men are good men. Are they careless? Either one of them could with a little percussion have found this effusion, after hearing the history. I am not writing this to in any way belittle any member of the profession, I will leave that to the laity, but I am only reviewing some things.

On the other hand, I might mention a time some years ago when stomach technic was not so well worked out as it is at this time, how a surgeon operated on a stomach for ulcer because I said there might be one present. He did not find an ulcer, so for several years now he has had the extreme pleasure, to him, of telling about this case every time he gets me in a crowd of doctors. Had I been like several

of our good men, I would have been there at the operation and made him look for that ulcer until he found it.

So you see this is not a one sided game by any means, and such illustrations only go to prove the fact that we need to get more closely together in our work.

No. 2. Here is another case in which there was some question. Eight months before I saw this man, he in walking in the dark, struck his right chest near the sternum, against the end of a wagon tongue. He became very ill and was put to bed. Later he was somewhat better and could get about some, but was very much incapacitated. He suffered much distress on the right side.

We see here the clearly defined mass extending from the middle shadow almost to the chest wall at the axilla. To my mind this is a clear cut case of aneurysm coming off from the first part of the arch of the aorta, although Hubeny in the June number of *Medicine and Surgery* shows an almost identical case and speaks of it as an aneurysm of the thoracic aorta. The internist called in a surgeon who suggested sarcoma. The most probable thing I think would be aneurysm, for we see the sharply defined border, and uniform density. Any other tumor of this shape and in this location would show more irregularity and some infiltration into the surrounding tissues. This patient was lost track of so I am unable to give postmortem findings.

No. 3. This slide was made from one of the pictures in Hubeny's article above referred to, and the diagnosis in this case was sarcoma. There is no similarity between the appearance in this case and the one last shown.

No. 4. This slide shows a carcinoma of the lung secondary to breast carcinoma on the opposite side. You see there is nothing in these last two cases that appears as a limiting membrane or clearly defined border, but there is more of a gradual fading off into the surrounding tissues.

No. 5. This man has been suffering from a sinus in his right side for several months. It would discharge nearly

all the time, a very small amount. When the discharge would stop he would develop considerable fever. I have had several of these sinuses to deal with and have found some of them connecting with the lung to such an extent that when the bismuth was injected, the patient would cough some of it out, showing communication with a bronchus. In this case you see we have simply a chronic chrondritis with abscess formation. You see the complete calcified shell of this one cartilage and none of the others showing. Note the opening of the sinus at this point where the injection was made.

No. 6. Please do not feel bored at my showing this old time illustration of a hydro-pneumo-thorax. It is shown only in order to introduce the next slide, also taken from Hubeny's article, showing the roentgenographing of these cases in the horizontal position.

No. 7. A little later on I will speak more especially of the different mediastinal conditions, but want you to notice here, that this patient has a very firm mediastinum or he could not stand this position. You see the under lung quite active.

No. 8. Another thing about the mediastinum. You have all seen cases of pleural effusion where one side would be tightly filled and the other quite free. In these cases the patients will usually breathe quite well, for they have one good lung and the heart may not be badly distressed. This is because they have a very firm or tense mediastinum.

No. 9. In other cases you have seen the mediastinum so lax that it is pushed almost, or completely, to the chest wall on the opposite side.

No. 10. Right at this time I would like to mention a line of investigation in some of those cases in which substernal distress is complained of. We all have the impression more or less, that the arch of the aorta is a fixed part, but I have found it very movable in some cases the same as the balance of the viscera. This slide was made from drawings

from three plates which would not reproduce well in group. The drawing was made for me by one of our competent investigators. The first plate was made with the patient upright, the second with the patient horizontal, and the third with the patient inverted at an incline of 45 degrees. These show very clearly how the parts change with change in position, and may be taken advantage of in the study of certain conditions.

No. 11. Right along this line might be mentioned the straight hanging heart and narrow mediastinal shadow in the tall thin individuals, and the short thick heart and mediastinal shadow in short waisted and plump individuals, and each distinctly normal for that type of physique. This must always be taken into consideration when looking for dilatation of the heart or aorta.

No. 12. This man had been sick for six months when he came under my observation. Examination by inspection showed very little. Two small glands were found near the clavicle on the right side. Roentgen examination showed a large dense mediastinal tumor and the right side completely distended with fluid. After the fluid was removed a very large tumor could be seen involving the mediastinum and extending far over to the right side. A careful study of the case by several men resulted in the diagnosis of Hodgkins Disease.

Roentgenization was started and given to the limit and in three months the man was feeling fine and back at work. When he first came he was in such distress that he had been unable to lie down for six weeks. Even the treatments had to be given in the upright position. Even after the fluid was removed he could not lie down until after he had been treated for some three weeks. His chest required the second draining but after that fluid never appeared again. As I said before, after three months he was feeling fine and working hard. This plate was made at that time. I

regret very much that I have not other plates showing the conditions at different times.

He thought he was well and quit treatment, and I lost him for about a year, when he came back with substernal distress and was treated again for a while and got better. Then he quit treatment again and in a few months came back for more treatment, of course feeling badly again. You know how these cases come and go.

Finally after my absence from the city for a few months, he came back again and this time in very bad condition. The growth had increased markedly in size and at the upper part was quite nodular. It had pushed the upper sternum and clavicle forward and was protruding above the clavicle into the neck. He was in great distress. Treatment was pushed again but rather irregularly, and he finally died after the illness had lasted something like four years. There is no question but what the ray prolonged his life for something like three years. Could he have been kept under careful observation and treatment, I feel that the final result would have been much better indeed.

No. 13. This is a case in which artificial pneumothorax was being used in the treatment of tuberculosis. You see the collapsed lung and how the other lung is being compressed by the mediastinum being pushed over. It seems to me that this would add a great deal of distress to the patient. This brings up the question again as to the condition of the mediastinum in a great many cases, whether it is lax or tense. Also this might be worthy of consideration in operative cases, and might be the explanation as to why some patients do so badly during chest operations when the pleura is cut and the lung collapses. The patient who has the tense mediastinum will stand the collapse of the lung quite well because he still has one good lung to use, but the one with the lax mediastinum will go to pieces because both lungs are put out of commission by the collapse of the one side with compression of the other.

No. 14. This is a plate of a subclavian aneurysm. They are not so rare by any means, but in my experience I have only seen a very few.

No. 15. The history of this case is briefly as follows: One year ago, this man during a runaway was thrown from a wagon and struck the ground on the back of his neck and shoulders. He was put to bed and has never been out of bed since. He had no paralysis for some weeks, but gradually began to show some cord irritation, and finally paralysis. At the time of this examination he was completely paralyzed. In the diagnosis you would have to consider three things: Potts disease with abscess pressure, new growth, and aneurysm. Aneurysm could be very easily ruled out as the tumor is too high in the neck and seems quite separate from the arch of the aorta. I made a diagnosis of Potts disease because of the apparent destruction of the bodies of the vertebrae and the light area that looks like the broken down center of an abscess. Operation showed the case to be one of sarcoma, and now as I look back over the case I am sure that there is no way in which the diagnosis could have been made from the plate and I should have left it as an open question.

No. 16. This was a case of stricture of the esophagus from carcinoma. This is the classical picture of this trouble, being high in the esophagus.

No. 17. This was a case of congenital stricture farther down.

No. 18. This is an illustration of dilatation of the lower end of the esophagus from either stricture of the cardia, or from cardio-spasm.

No. 19. This lady gave a history of difficulty in swallowing, dating back twenty years, the difficulty gradually becoming worse. For something like two years past, she has had times when she could get nothing at all into the stomach, then after a few days she could get very thin fluids down. Of late she says she has been unable to get anything

at all into the stomach, and this could readily be believed for she is very much emaciated and she tells me that she used to be a large fleshy woman.

Before being sent to me she had been examined by a surgeon who does his own Roentgen work. His diagnosis was, stricture of the esophagus, diverticulum of the esophagus, and mediastinal tumor. The patient brought a plate with her which to the mind of the surgeon proved these conditions to be present.

Although the patient stated that she had had nothing to eat or drink for several hours previous to the examination, still, with the Roentgenoscope it could be seen at once that the esophagus was full of fluid. The filling of the esophagus with the bismuth suspension gave us a very strange looking picture and it was some time before we were able to make a definite conclusion. But as a larger quantity was taken the picture began to take on the definite form that you see in the illustration, which is a very fine illustration of this type of the greatly dilated esophagus.

The patient refused operation and returned to her first adviser who put her upon medical treatment. After something like two months she came back to me for another examination to see if she was improving.

With the Roentgenoscope it was very easy to see what kind of treatment she had been taking, for the esophagus was full of bismuth so that it could be seen just as in this picture without the use of further opaque material. I advised her that the medical treatment was doing her no good.

In conclusion I would say, that anything that I have said here about the Roentgenologist, the internist, or the surgeon, has been said only in order to emphasize the fact that we need closer team work all along the line.

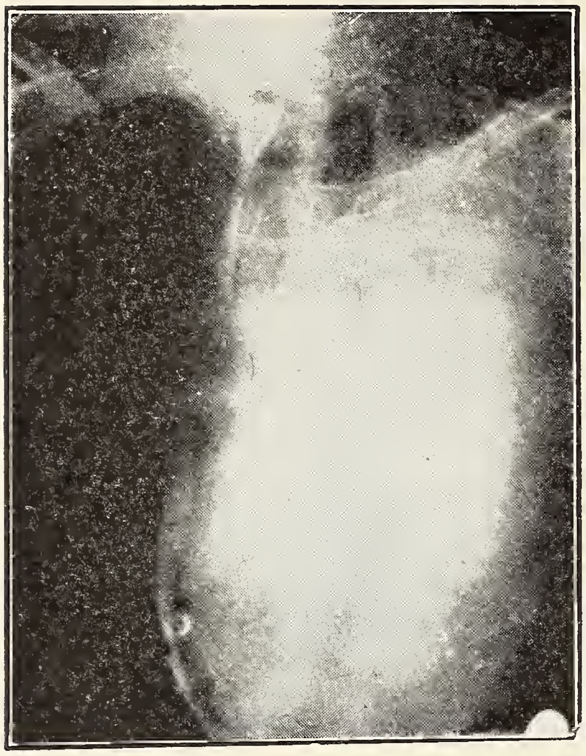


Plate 1

Plate 2

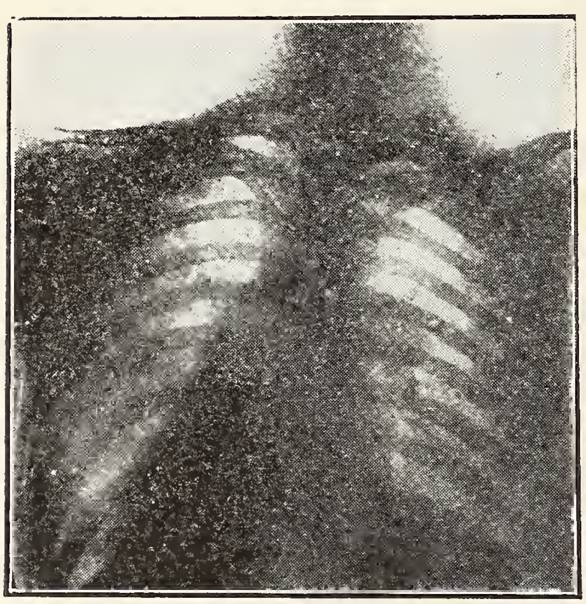


Plate 3

Plate 4

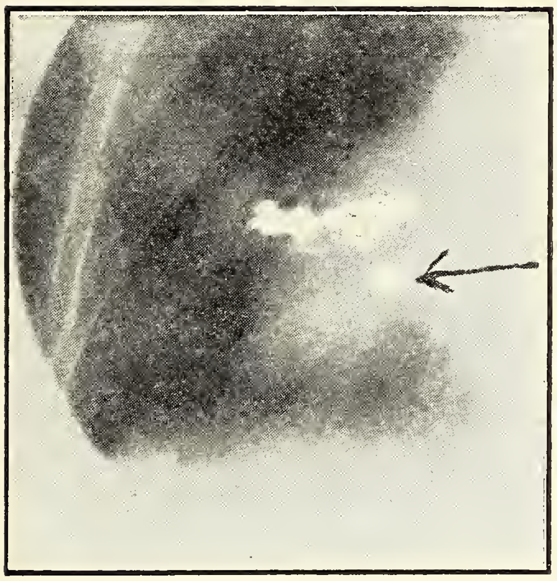


Plate 5

Plate 6

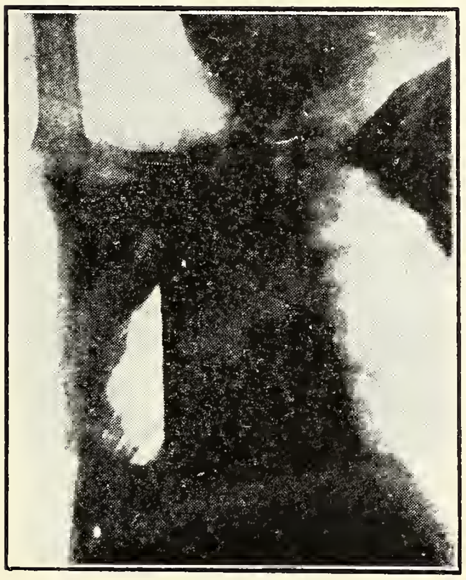


Plate 7

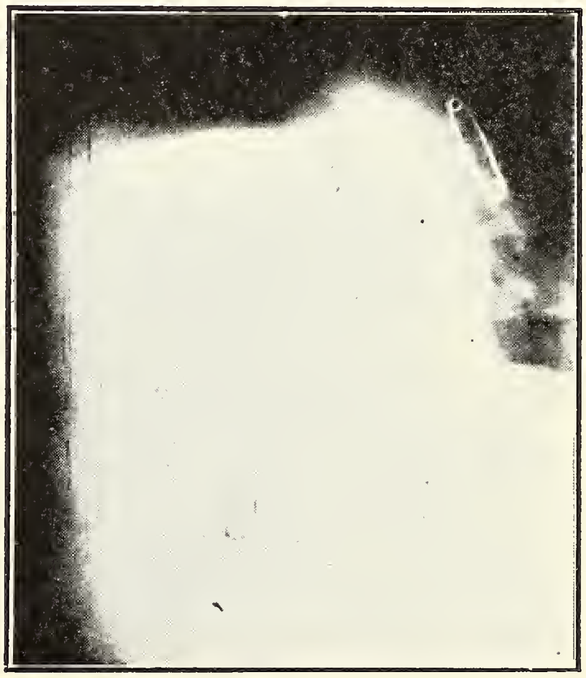


Plate 8

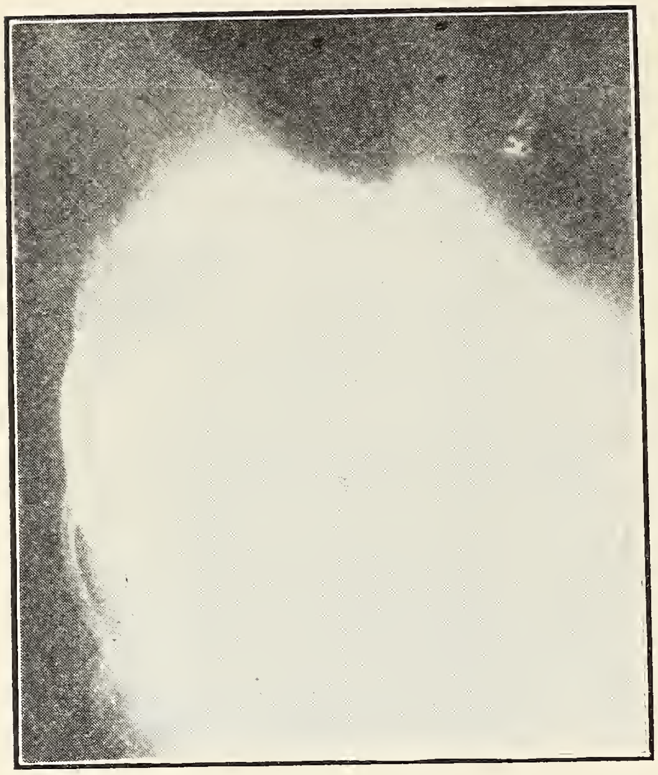


Plate 9

Plate 10

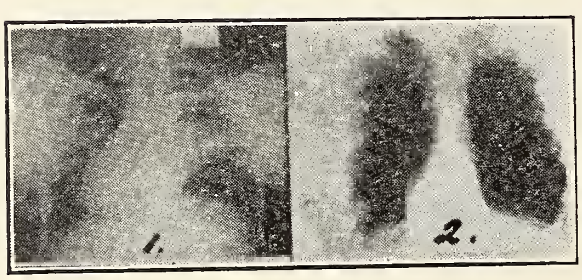


Plate 11

Plate 12

Plate 13

Plate 14

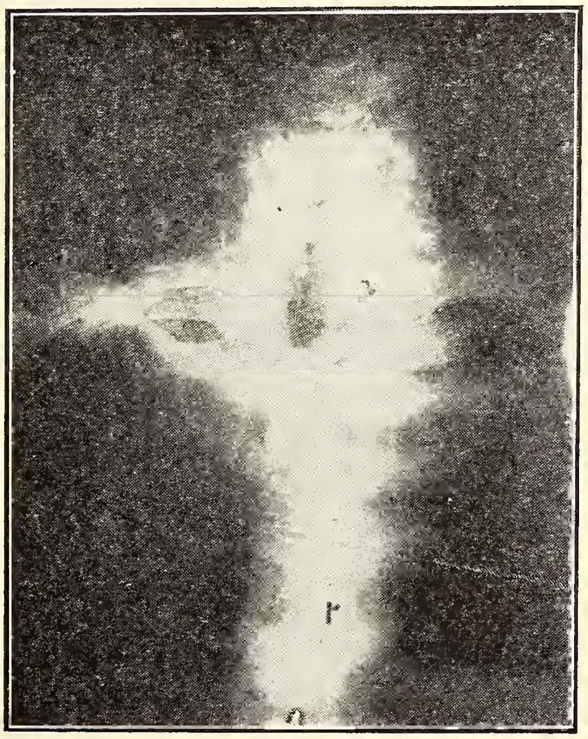


Plate 15

Plate 16

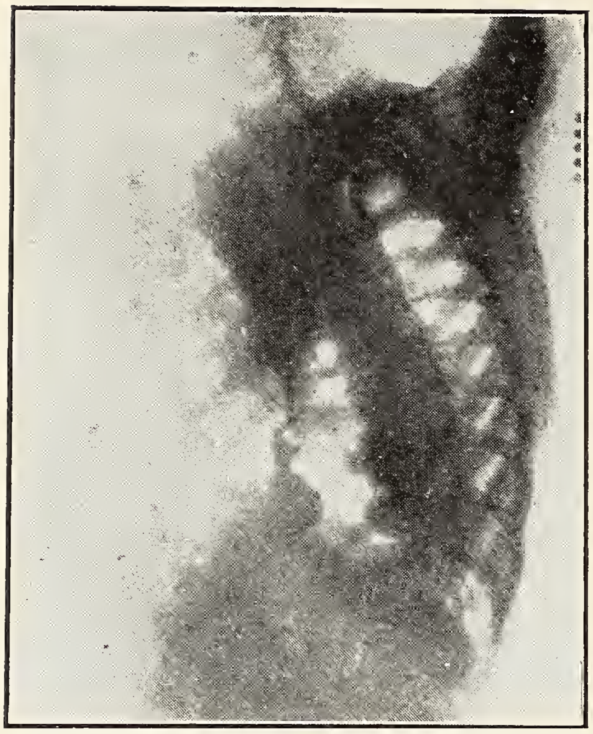


Plate 17

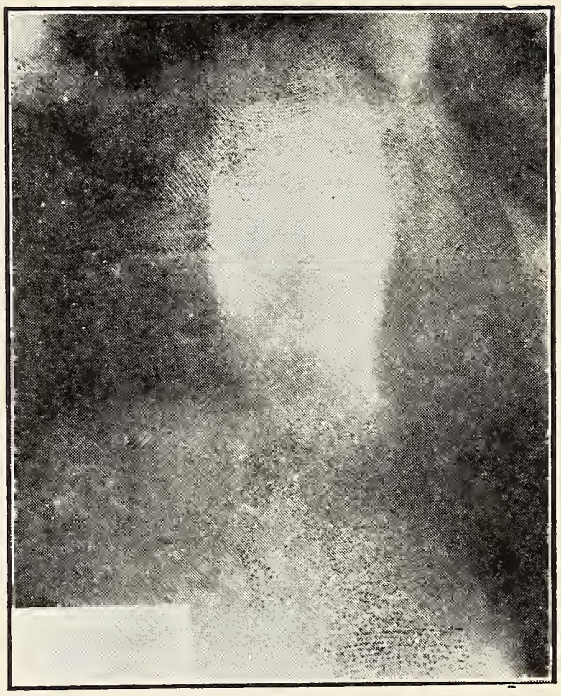


Plate 18

Plate 19

A ROENTGENOLOGICAL METHOD OF MEASURING THE POTENTIALITY OF VOICE RESONANCE

Glenn Newton Merry, M. A.
Associate Professor of Public Speaking
University of Iowa
Iowa City, Iowa

Roentgenology offers considerable aid to the student of voice problems. The problem of voice resonance continues to be one of the big problems for the teacher or pupil of speech and song. No one familiar with the most elementary instruction in this field is unacquainted with the stipulation, "place the tone in the head." What is meant? Is there any tone that is not "placed" in the head?

1. It would seem that the answer must be negative. The laws of the physics of sound obtain for the tone produced by the human mechanism just as they hold for the tone produced by the violin or by any other musical instrument. Experiments carried on in the Speaking Voice Laboratory of the University of Iowa show the very great probability that there can be no resonance from the chest cavity. The experiments are relatively simple. The human chest is filled with the spongy, moist lungs and mucous membrane. Experiment with a glass resonator attuned to a certain vibration, of a capacity similar (or smaller) to that of the chest. Fill the jar two-fifths full of heavily moistened gauze. Vibrate the tuning fork over the mouth of the jar and resonance will be imperceptible. Provide similarly a jar with a narrow neck to duplicate the trachea. It will be found that the neck will provide a slight resonance for one tone only and that of a very much higher pitch than that responded to by the large cavity of the whole jar. The

above may be performed with other conditions adjusted more nicely; but the result is essentially the same. Therefore, the term "place the voice in the head" so common to speech and song instruction is meaningless. Furthermore, the term "voice placement" is inadequate and uncertain. One cannot "place" his voice where he wills, as he might place a pencil behind his ear. The roentgenologist can demonstrate that the term "adjustment" is much better. Place the subject before the fluorescent screen and let him speak or sing while turning his body so that the roentgenogram shows both postero-anterior and lateral views. The adjustment of the organs *regulating resonance* is plainly visible. Without doubt, then, roentgenology shows that the voice is produced by varying or adjusting the size and shape of the resonator and that "tone placement" not only is incorrect but is conducive to misunderstanding when given to the student. The argument that great singers have used the term does not justify its continued use among those who have interest in the science of voice.

2. There is "head resonance" only, then, with the definition of head embracing that part of the neck including the larynx. How may roentgenology contribute to the study of the resonance chambers? Its greatest service rests in the assistance it renders in the determination of the size and shape of the resonator in the nasal passages.

Do the accessory sinuses provide resonance for the voice? The great service rendered by roentgenology in clearing up this problem is at once apparent when it is considered that no conclusive data can be computed from a study of skulls alone. The sizes and shapes of the sinuses of the living individual must be studied with relation to the pitch, intensity and quality of voice. I shall not discuss the variation in the sinuses primarily. That has been done.[1] Suffice it to say that the fact of variation suggests the possibility

[1] Prentiss, H. J., M. D. Roentgenological Interpretation of the Accessory Sinus Variations. *American Journal of Roentgenology,* August, 1917.

of resonance influence. I have examined 66 cases of students taken from my classes in public speaking who had voices of suggestive evidence. All cases were normal. By normal I mean they were without organic or mental defects that were sufficiently prominent to provide apparent new conditions. These demonstrate an average and the usual extremes. The extremes provide the more interesting data for this particular point.

The exposures were made of each individual so that a lateral view was obtained for the stereoscope. The best center of focus provided by our roentgenologist has seemed to me to be that of one inch to the anterior of the Sella Turcica, with the head in the status of plumb as for Sella Turcica views. A single postero-anterior view also was made of each case to facilitate checking up on the frontal.

Voices were recorded before the exposures were made, upon an Edison Opera Voice Machine. These records of voices together with the auditory memory of the investigator and the ever present opportunity of calling the student into the laboratory in case of doubt, provided the bases for comparison.

These extreme cases showed those with very small sinuses, and those with very large sinuses; those with one or more sinuses diseased or partially filled, and those with no diseased condition. This fact seems absolute as far as I have been able to study the cases: there is a tendency for the voice to be musically resonant, nasally, and more intense where the sinuses are larger than normal in size.[2] Likewise where the sinuses are small, especially the frontal, the ethmoids and the sphenoid, there is a tendency for the voice to be less intense and rather devoid of nasal resonance. The student with the largest sinus measurement was a young woman specializing in the field of public speak-

[2] I have accepted as ''normal size'' the measures determined by Tilley and by Berry as set forth in the latter's statement published in the *Archives of Radiology and Electrotherapy,* June, 1915. Dr. Berry's series of three articles of which the above is the second are of value in the subject of measurements.

ing. She possessed a voice of splendid musical quality in which mouth, throat and nasal resonance were well blended. The case showing the smallest sinus measurement, likewise, was a student so specializing,—but a young woman whose voice was unmusical and non-nasal in resonance similar to that of a child with large adenoids. Her roentgenogram showed one antrum blurred, suggesting inflammation. She complained of a cold in the head habitually during the winter. However, a clearing of the antrum yielded no perceptible difference in tone.

One case, that of a young law student, intending to spend the summer as platform superintendent of a circuit chautauqua, provided a speech disorder in which the voice possessed little nasal resonance. The roentgenograms showed normal sinuses with antra filled with pus. Drainage seemed to improve slightly the nasal resonance; but the improvement was not marked. It was a matter of commercial value to him if the disorder could be relieved. A nodule was removed from a vocal cord, and the voice in time became quite normal. His case together with other cases, however, tends to show that sinuses filled with an inflammatory exudate do not materially affect the voice nasal resonance.

The laws of physics demonstrate that a cavity the size of a sinus with as small an opening as that possessed by a sinus will respond as a resonator to no vibrations possible in the human voice. That is, the pitch must be so much higher than that possible in voice.

It therefore remains a problematic study which only roentgenology can clear up for us as to just how much influence healthy sinuses have on resonance. Because of the facts stated above in which voices with extremely large sinuses seemed to possess greater intensity and nasal resonance, I am not willing to admit that the sinuses play no part in resonance.

3. Where there are large sinuses and good voice intensity and quality, is it not possible that other factors than

sinus sizes affect the resonance? This is possible. For instance, the nares may be of large size laterally, vertically and in depth. It seems to me that measurements of these factors offer the greatest service from roentgenology, for these measurements of the living subject can be obtained in no other way so accurately. And these measurements are of value in determining the possible potentiality of the voice in vocational education. Where the ambitions of a boy or girl in adolescence are directed toward a vocation involving the ability to speak or to sing, this is a factor of considerable importance: could the child ever develop a voice of superior resonance?

Then too the teacher who is confronted with defective resonance among his students can sort out those incapable of superior resonance from those capable by means of the roentgenological measurements.

The law of physics justify this method and the 66 cases I have examined show no absolute contradiction. The method of measuring is subject to great improvement, but so far I have found none better.

These measurements are computed in linear millimeter units. A lateral and a postero-anterior view are used. In the postero-anterior view a quadrilateral is described by the nares. The top boundary lies between the orbits in the region of the Cristi Galli. The lower boundary is determined by a line drawn from the extreme outer limit of the right air passage of the nostril to the extreme left outer limit of the left air passage of the nostril. The quadrilateral is completed by connecting the right termini of the top and lower lines and then by connecting the left termini of the lower and top lines; as illustrated in Fig. 1. The millimeter length of these lines may be termed the linear length of the postero-anterior quadrilateral of the nasal resonance chamber.

In the lateral view, similarly, a quadrilateral may be described by drawing straight lines from the Cristi Galli to

the lower anterior of the antrum, then along the floor of the antrum posteriorly to the spinal column. From this point direct a line to the most anterior curvature of the sphenoid. Connect this point with the Cristi Galli. (See Fig. 2.) These combined lengths may be termed the linear length of the lateral quadrilateral of the nasal resonance chamber. The sum of the linear lengths of both quadrilaterals may be termed the resonance potential of the individual. Where this length is greatest I have found the best nasal resonance or voices capable of developing excellent nasal resonance, and where length is smallest less potentiality.

The largest resonance potential found was 450 m.m. and the smallest 362 m.m. The average resonance potential was 411 1-3 m.m.

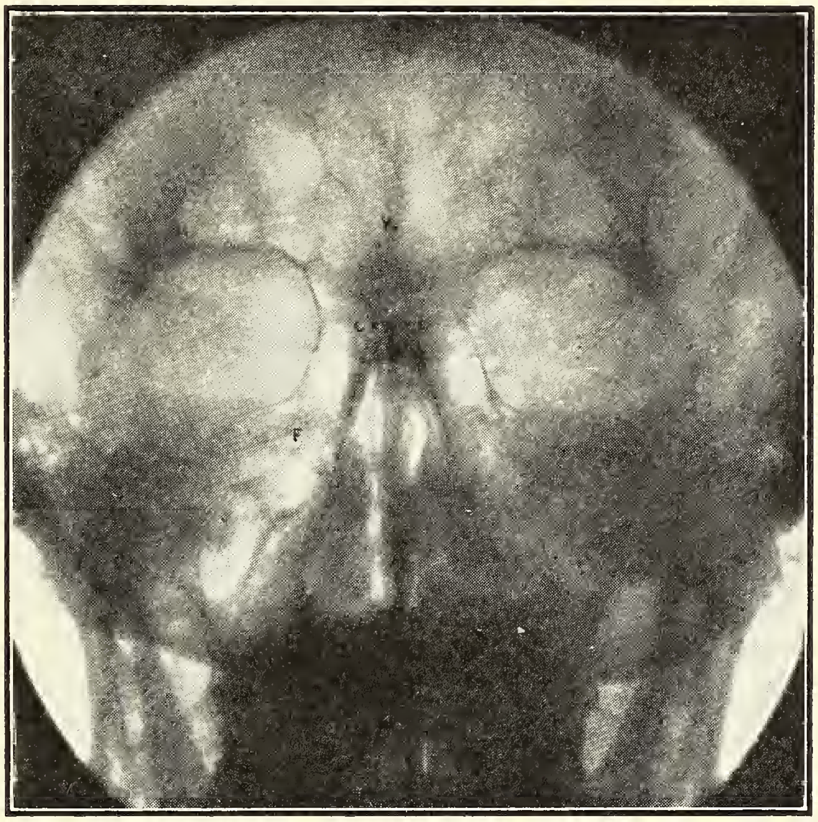


Figure 1

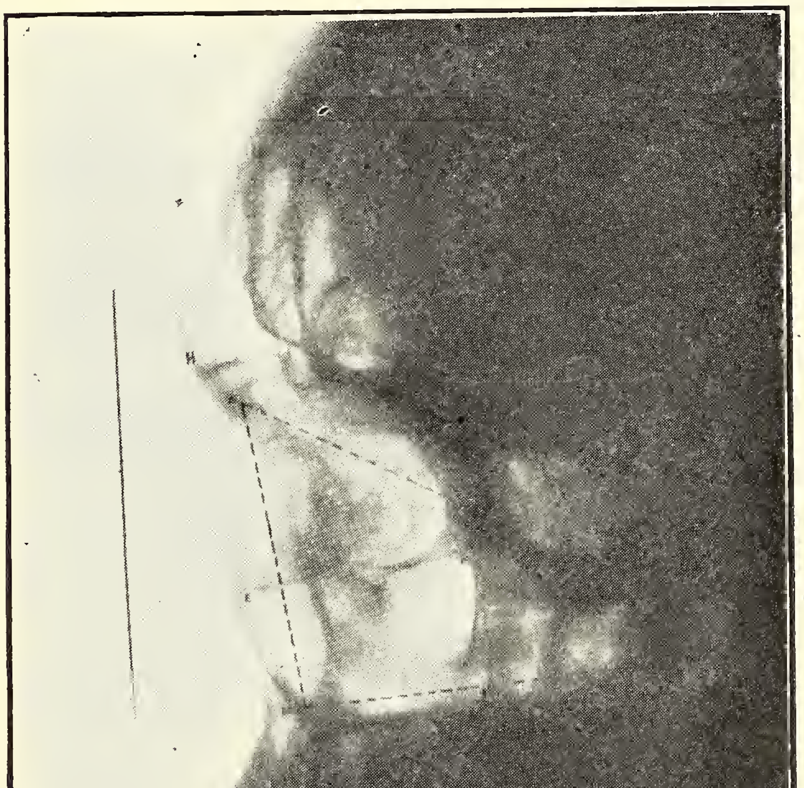


Figure 2

Case Reports

SQUAMOUS CELLED EPITHELIOMA RESPONDING TO ROENTGEN AND RADIUM THERAPY

Bundy Allen, M. D.
Roentgenologist, University Hospital, State University of Iowa, College of Medicine

Patient 7694, C. S. W., dealer in insurance and real estate, white, American, single, 69 years old. First entered the Department of Eye, Ear, Nose and Throat, S. U. I. Hospital, in January, 1918.

History: About eighteen months or two years ago a small pimple appeared upon the left side of the nose. This gradually grew larger, ulcerated, and at the end of six months was about the size of the thumb nail, discharging considerably. The growth continued to about the size of a small orange (Fig. One), at which time Roentgen and Radium therapy was advised.

About six years ago a similar growth developed on his right temple, and in two years had reached the size of a small egg. This was removed, and a skin graft operation performed at Johns Hopkins. For the past year there has been a small spot, about three-fourths of an inch in diameter, at the upper end of the graft. This has been rough and reddened.

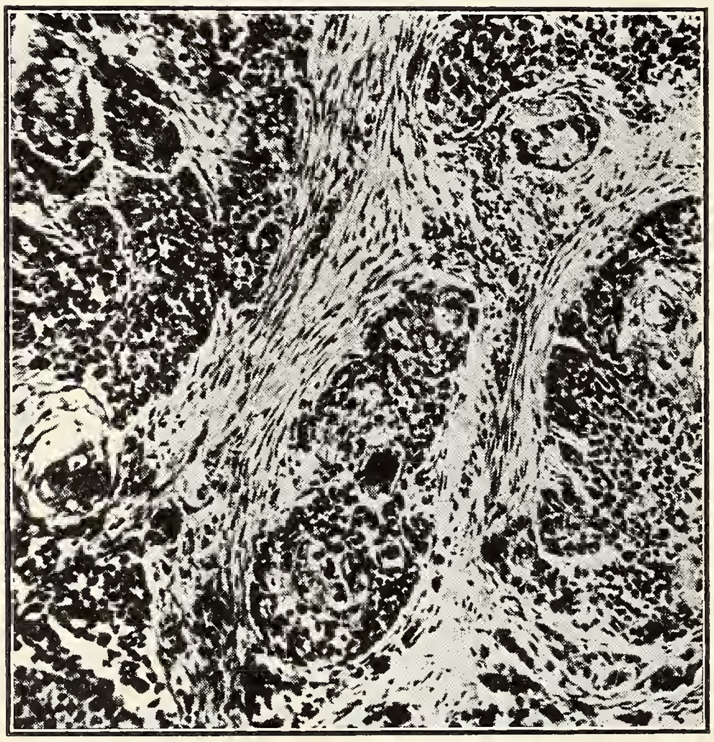
Just over the bridge of the nose is a small rough elevated growth, about one inch by three-fourths of an inch, which started about a year ago as a small pimple and gradually grew. Patient has worn nose glasses about twenty years and this growth is just where the glasses rest.

About one and one-half inches below the left eye, and

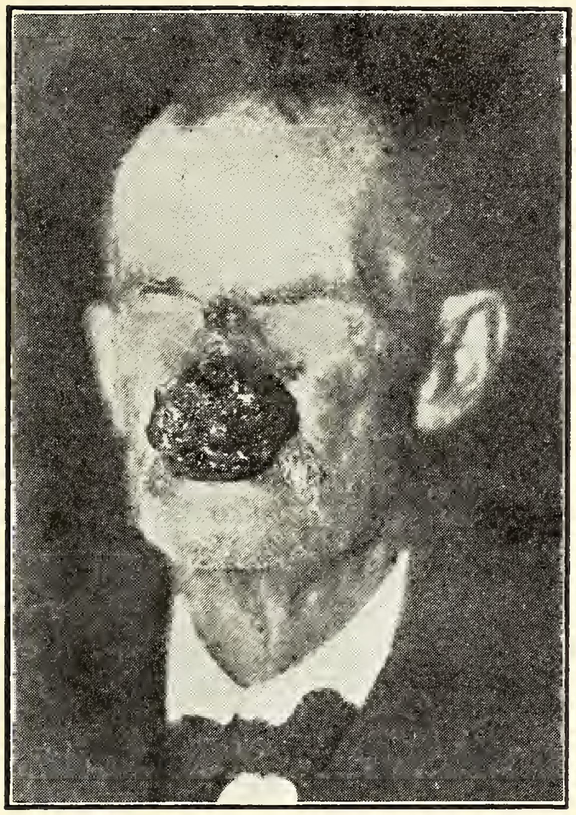
near the nose, is another small rough growth, which has been there four years, but has not grown any until recently. There has been very little pain with this trouble, and very little loss of weight. Two months ago he began to have difficulty in breathing through nose. There is no other history of nose trouble. Eye, ear and throat history negative. Family history: Mother's sister died with carcinoma of the face. Father died of pulmonary tuberculosis at the age of fifty-six. Other family history, negative. Social history, negative. Examination: Nose appears enlarged in all dimensions and reddened. There is a shallow excavation on the end of the nose, just above the tip, and including the left lower edge. The excavation is one inch by one-half inch and extends from one-fourth inch to the right of the mid line to three-fourths of an inch to the left of the mid line. Just above and to the left of the excavation is a dark spot, which is the location of the discharge of a few weeks ago. The left anterior nares is completely filled by a mass, the size of a large hazelnut. A similar growth is found in the upper part of the right nares. On the bridge of the nose is a rough area, composed of several small nodules. The left face presents a reddened appearance. There is a skin graft on the right side of the face, with some reddened areas at upper and lower angles of the graft. There is a mucopurulent discharge from the left nostril. The growth in the nostril is rather firm and not attached except in its upper portion. On trans-illumination, antra and left frontal, clear. Right frontal cloudy. X-ray examination of the accessory sinuses negative. Eye, ear and throat examination negative. Laboratory test negative.

Note made by Dr. Dean, that the external tumor mass has been removed by Roentgen and Radium therapy leaving white scar tissues. The tip of the nose is flattened, but the result is fine. Within the nose is a mass the size of a large hazelnut, rounded, hard and bleeds easily. Advise: Roentgen therapy and if no improvement, rhinoplasty. On

June 19, 1918, rhinoplasty was performed by L. W. Dean, M. D., Iowa City, under ether anesthesia. Large pedical flap was taken from the forehead to form the nose. A tiersch graft from left thigh was used over exposed surface on forehead. The pathology report from section of nose showed squamous cell carcinoma. Hot dressings were used until August 3, 1918. At this time the flap on nose was well attached and there was no suppuration. There was some necrosis in the center of the tiersch graft, but this slowly granulated over and by the middle of September, 1918, the wounds were completely healed and the patient was discharged.

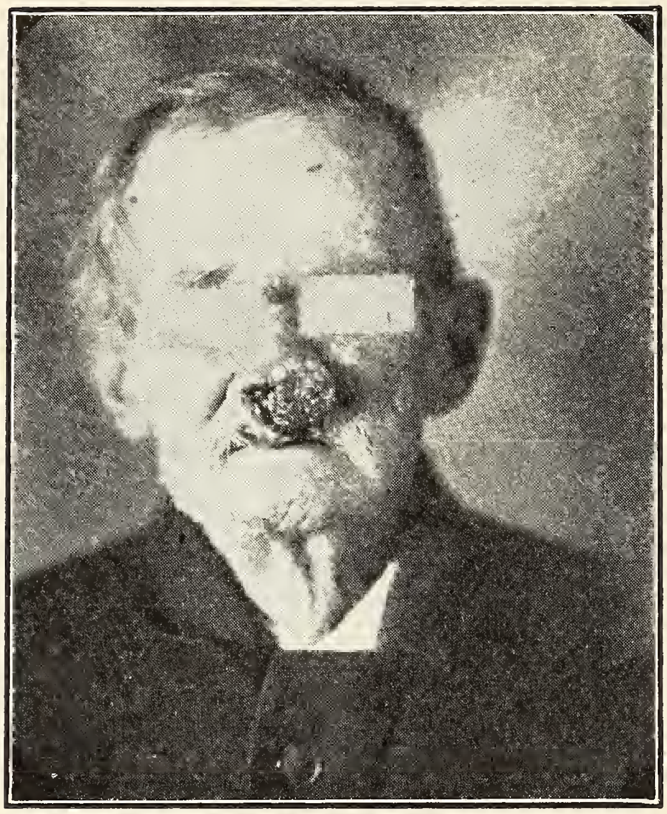


Photomicrograph of Case 7694 Made with 1/6 Lens and No. 4 Eye Piece

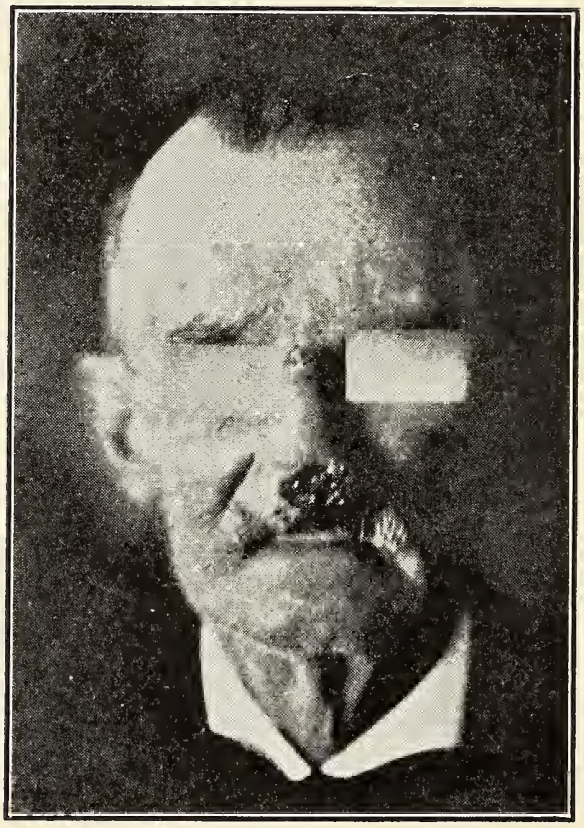


Case 7694 W., Mr. C. W.
Squamous Cell Epithelioma

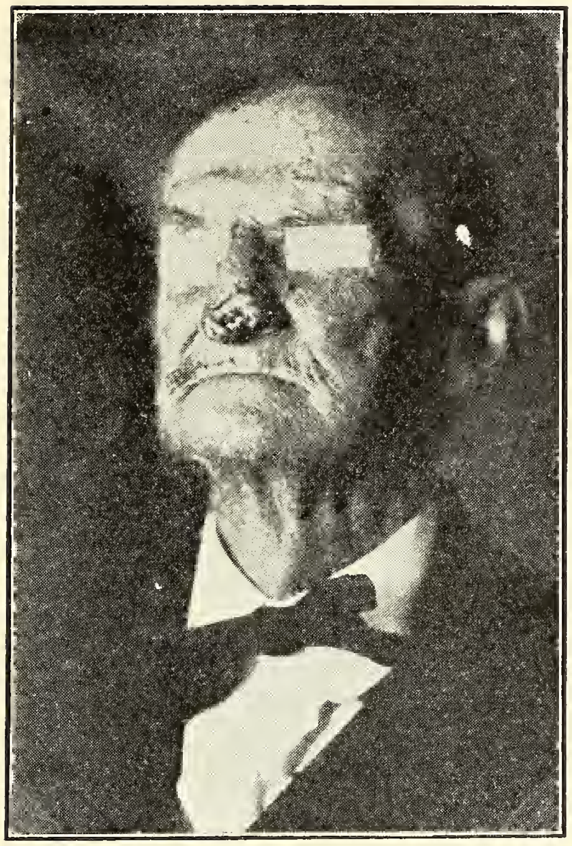
Case 7694 W., Mr. C. W.
December 15, 1917



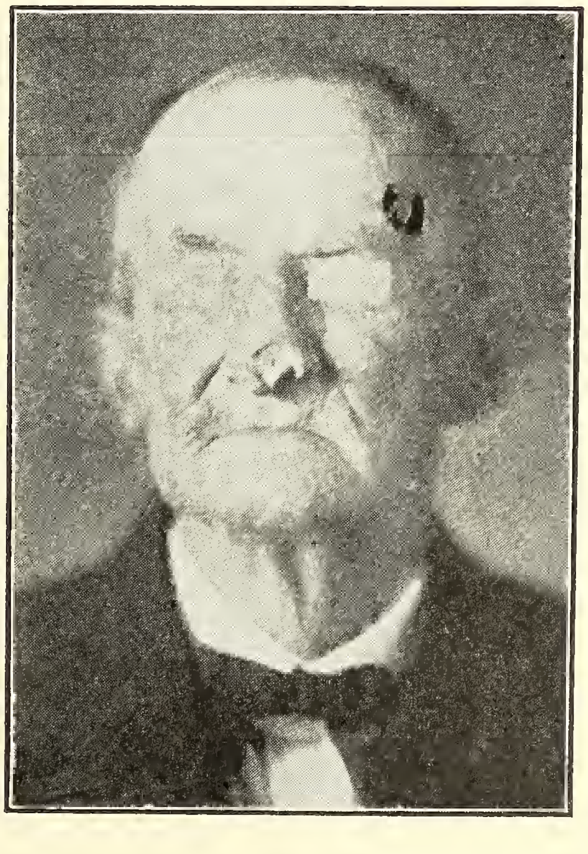
Case 7694 W., Mr. C. W.
January 12, 1918



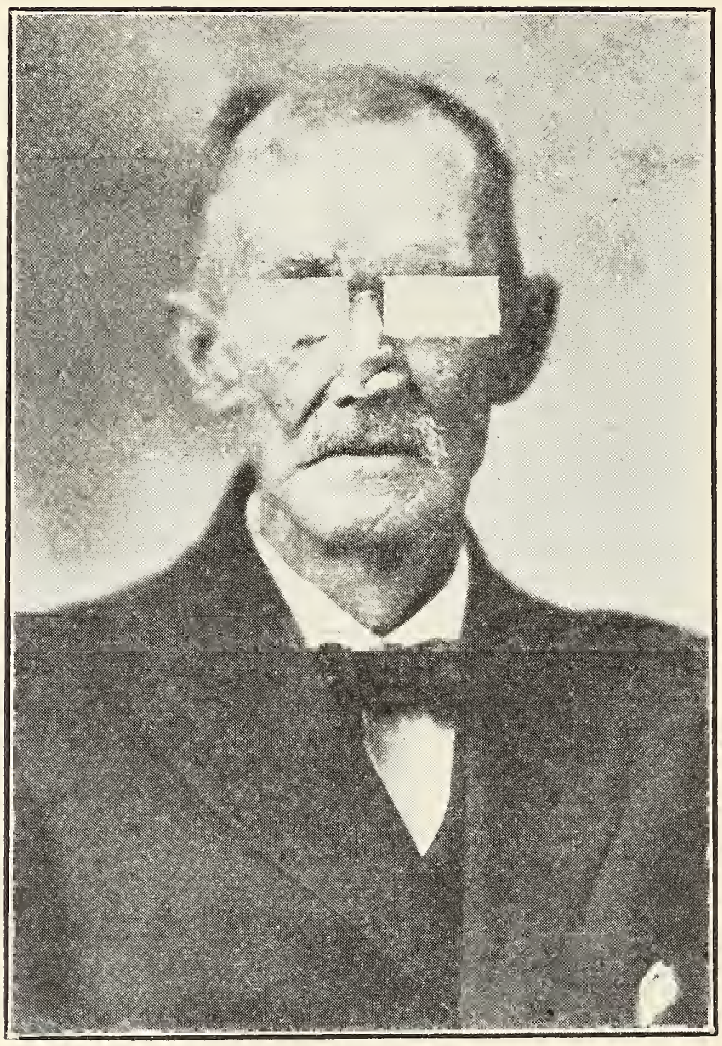
Case 7694 W., Mr. C. W.
February 2, 1918



Case 7694 W., Mr. C. W.
March 1, 1918



Case 7694 W., Mr. C. W.
March 14, 1918



This plate shows the result of the application of 1200 milligram hours of radium and 1600 milliampere minutes roentgen therapy followed by rhinoplasty, as stated above.

LEFT BRONCHUS FILLED WITH BISMUTH PASTE

C. H. Ballard
Omaha, Nebr.

Bennie L. Age 1½ years. Family history negative as far as known.

Personal History: Had pneumonia in June, 1916, from which he apparently made a good recovery except for a slight cough. He was up each day, played about the house and ate well.

Present Illness: About July 24th, 1916, he exhibited chills and fever. There was dullness to percussion over left lung. He was removed to the hospital and operated for empyema and fully eight ounces of pus removed. In ten or twelve days the drainage was removed and wound healed normally. About two weeks later the wound was re-opened and drainage established. After this the wound did not close but was discharging continuously.

Aug. 22nd, 1916, the surgeon injected bismuth paste into the fistula in order to outline its extent and referred the patient for roentgen examination.

Roentgen Findings

Upon roentgenoscopic examination the left bronchus and many of its branches were shown to be well filled with the paste and stood out in bold relief in the surrounding tissue. This was corroborated by the roentgenogram. The lung itself showed increased density and mottling due probably to unresolved pneumonia and thickened pleura. The surprising point about the case was that the injection caused no alarming symptoms whatever, not even coughing was produced, due to the fact no doubt that the bronchus had contained pus over a period of several weeks and lost its irritability. The patient left the hospital one week after the roentgen examination. Nov. 28th, 1916, the patient was again operated as follows: In the left mid-axillary region

portions of the fifth and sixth ribs were removed. A sinus with a small cavity about the size of a walnut with thick walls was found. Some pus was present. The cavity was packed with gauze and allowed to heal from the bottom. A plate taken December, 1916, by another roentgenologist showed some barium still remaining in the bronchus.

I last saw the patient May 1st, 1918, this being one year and ten months after the first operation. He apparently was healthy in every way. His father says he eats, sleeps and plays well; has had a normal growth and does not cough. All efforts to induce the parents to bring the boy in for another roentgen examination failed.

I have read of only one similar case, and if any of the society members have met with a like case I would be glad to receive a report of the same.

Bickner, Walter N. Pain in the arm. Subdeltoid Bursitis. *Journal A. M. A.,* Oct. 13, 1917.

The roentgenologist is often called upon to examine a painful shoulder in which a slight fracture may or may not be suspected. If no fracture is found one should always keep in mind the possibility of subdeltoid bursitis and not dismiss all cases with a diagnosis of sprain.

Dr. Brickner has had experience in over 200 cases, 18 of which he operated and the results so gratifying that I think a digest of his article worthy of consideration.

I will state, however, that in my limited experience some cases showing lime deposits in the supraspinatus tendon have had no symptoms whatever but this does not argue against the entity of the disease.

The author emphasizes the importance of a roentgen examination in cases of persistent pain in the upper arm and shoulder.

Far more common than any or all causes of pain in the arm and sometimes, but by no means always, also in the shoulder, is subdeltoid (subacromial) bursitis. It is, indeed,

so often the cause of the complaint that it should be thought of first.

Of the etiology in brief he says: although a history of injury or of muscular violence is often unobtainable, I believe that the immediate cause of subdeltoid bursitis is traumatic, usually a squeezing of the supraspinatus tendon (occasionally the infraspinatus) and the bursa between the acromion process and the greater tuberosity of the humerus when the arm is abducted. This injury may, and often does, happen from a fall on the outstretched arm or other external violence. More often it happens from internal violence, as in raising the arm to beat a rug, hanging from a car strap, etc.

Small fractures of the greater humeral tuberosity, which, as I have said, may also be produced by muscular violence, are probably also associated with the inflammation of the overlying subdeltoid bursa (which accounts in part for persistence of the shoulder disability after this injury, if it is not treated, as it should be by abduction). Indeed, the lesion is much the same as subdeltoid bursitis without fracture—in one case there is a tear of the supraspinatus tendon above its attachment, and in the other, a tear through its bony attachment.

Another factor is some metabolic predisposition to the deposit of lime and other mineral salts in or on the supraspinatus and occasionally the infraspinatus tendon. It occurs only in adults, females as well as males. In some persons, within a day or two after a mild internal violence or an external injury, the roentgenogram will reveal this characteristic deposition of lime above the greater tuberosity of the humerus.

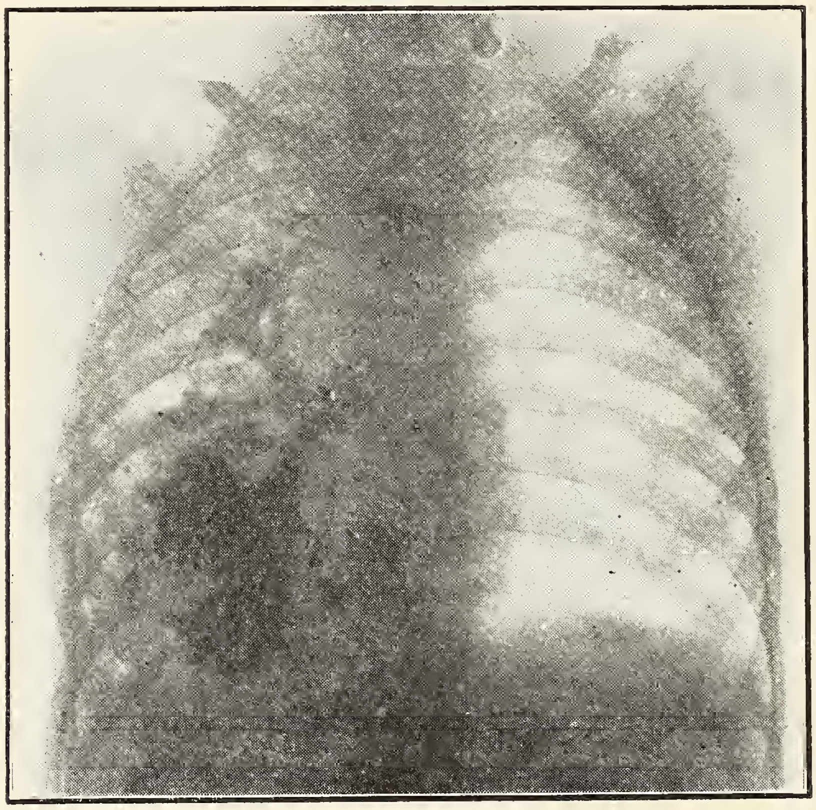
I have reasons to believe that subacromial bursitis is neither infectious nor toxic in origin.

In all of the eighteen patients I have operated on, I found the same lesion in the bursa—adhesions between its two walls.

The lime deposit is not in the bursa, or in its walls. It lies under the bursa, either wholly within the supraspinatus tendon, or on it, or partly within and partly on it. The tendon may have to be split to reveal the deposit or deposits, or the calcareous mass may be plainly seen lying in the tendon. Occasionally the deposit is in the infraspinatus tendon. Sometime it will be found scattered about on the periosteum in the neighborhood of the greater tuberosity.

The lime deposit takes place, not slowly but very speedily after the injury.

The symptoms of subdeltoid bursitis are two: Pain and disability in shoulder movements. The pain sometimes radiates into the forearm, and hand, the fingers or the neck.



His treatment consists of putting the patient to bed, supported on several pillows and with his arm raised as far as he comfortably can abduct it. A towel or bandage sling is passed from the waist or elbow to the head of the bed, and this end of the bed is raised on blocks or chairs. It will

often be noted that as soon as the patient is comfortably recumbent he can abduct his arm more than when standing. As he gradually slides down in bed his arm correspondingly goes up; and it is no rare experience in a patient who has not abducted his arm more than 45 degrees in many months to find it thus fully and painlessly abducted in twenty-four hours.

Codein and acetyl-salicylic acid are helpful aids in overcoming the pain the first day or two. If this treatment does not cure he advises operation. C. H. B.

NEW APPARATUS

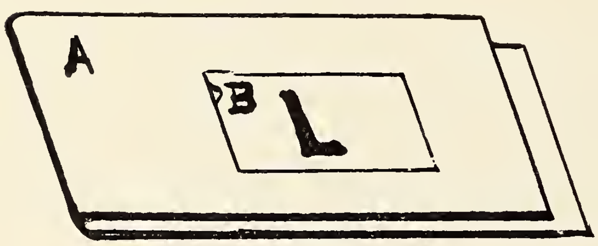
A method of mounting dental films which I find to be entirely successful is shown in the accompanying photograph. At each corner of the film negative a small portion of the emulsion side is scraped away by a sharp knife or chisel, as shown at (*a*). To each of these corners so pre-

(a) Emulsion removed at corners of films.
(b) Frosted celluloid backing.

pared a minute drop of celluloid cement is then applied and the film immediately thereby cemented to the *smooth* surface of a strip of frosted celluloid backing, pressing the corners down for a few seconds by the fingers. The warm fingers aid in setting the cement and binding the film to the backing. The celluloid cement is prepared by dissolving discarded films cut up into small pieces in acetone and diluting to the consistency of thin syrup by adding more

acetone. Filter through cotton and add about one-tenth volume of 98 percent alcohol to act as a retarder to its setting. The cement may be applied to the film corners by a bit of wire passed through the cork of the containing bottle. The bottle should be kept well corked as the acetone is very volatile. Should the cement thicken it may be readily thinned by adding acetone. The celluloid backing may be purchased in large sheets and cut to any dimensions desired, allowing such margin as may be advisable for descriptive matter to be written in. E. B. Knerr, M. D.,
Research Hospital, Kansas City, Mo.

A CONVENIENT PLATE MARKER



A =Aluminum Clip.
B =Adhesive.
"L"=Lead Marker fastened under the adhesive to the clip.

A very convenient plate marker may be made as follows: Bend a strip of sheet aluminum 3½ by ¾ inches in the middle in the shape of a clip. To this attach by means of adhesive such lead markers as may be desired and slip the clip over the envelope-enclosed plate near a corner or other convenient place, at the time of exposure. Several such clips with "R" on one side as a "right" marker, and "L" on the other side as a "left" marker will serve ready usage. I have made and used these clips now for several years and prefer them to any other device yet suggested. See illustration. E. B. Knerr, M. D.,

UNUSUAL FRACTURE

The unusual, while not especially instructive, is of great interest. The two cases shown are not common.

Master S. had sustained a fracture of the femur about four months previous to the time he was referred to me for

examination. Fig. I shows the condition at that time. Here is shown what nature will do under favorable conditions. The average doctor is uneasy after putting up a fracture for fear the ends of the bones are not touching each other. Fig. II shows the condition after operation.

Fig. III was taken about three hours after the patient had shot himself with a thirty-eight caliber revolver. The patient came walking, unassisted, when he entered the laboratory. The bullet had entered below the chin, close to the hyoid bone, gone through the tongue, the nasal cavity, the frontal sinus and partially through the outer plate of the frontal bone.

E. H. Kessler, M. D.
3446 Shenandoah Ave.
St. Louis, Mo.

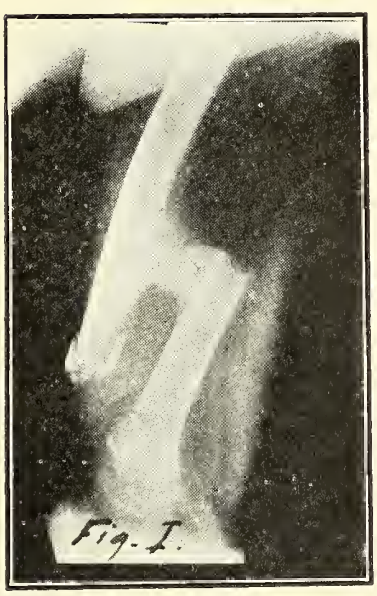


Fig. I

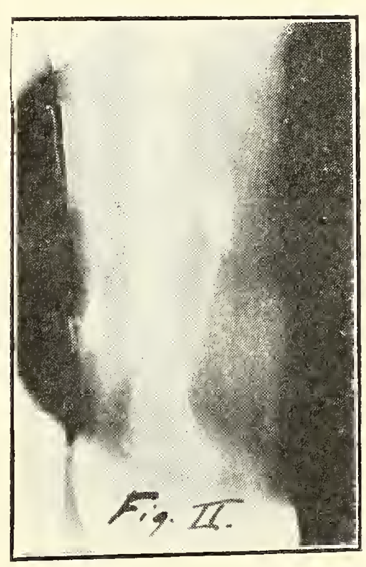


Fig. II

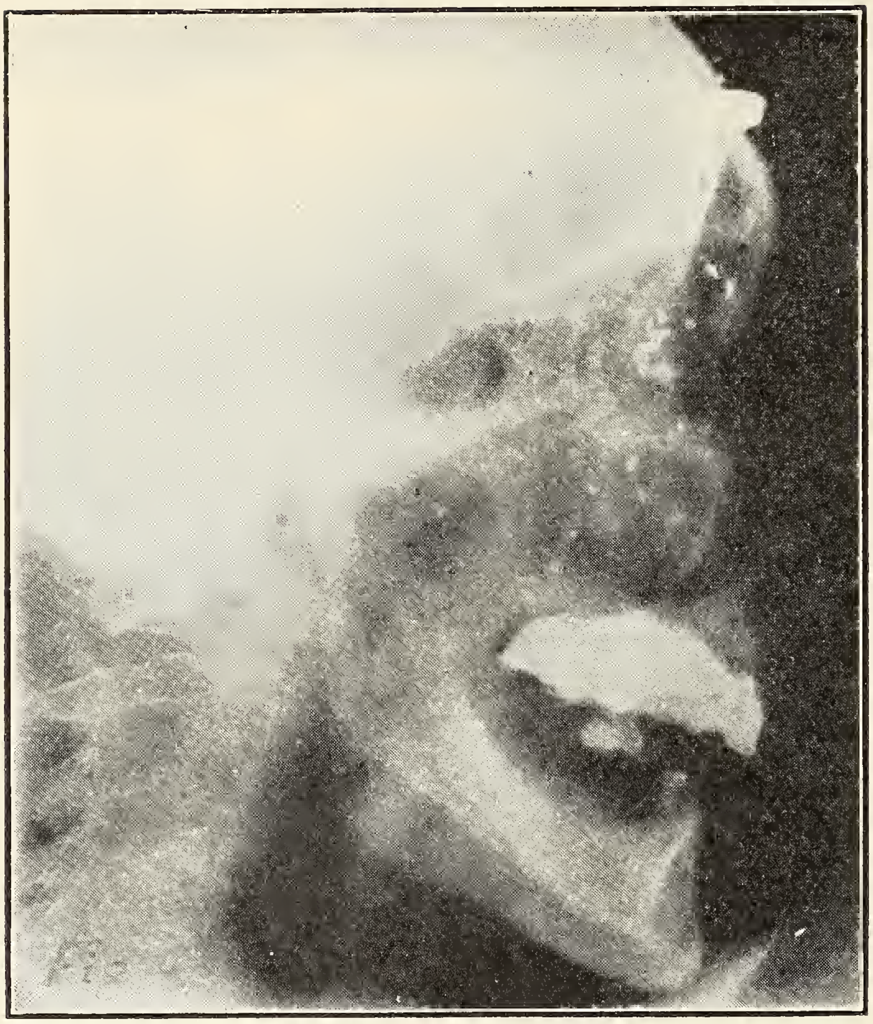


Fig. III

BOOK REVIEW

Roentgen Diagnosis of Diseases of the Head. By Dr. Arthur Schüller, head of the clinic for nervous diseases at the Franz-Joseph Ambulatorium, Vienna. Authorized translation by Fred F. Stocking, M. D., M. R. C. Approved for publication by the Surgeon General of the United States Army. C. V. Mosby Company, St. Louis, 1918. $4.00.

The valuable contents show the accomplishment obtained, by much time and extensive energy, by way of research and personal observation. It is remarkably interesting to note the rapid stride that the science of Roentgenology is making, as is shown by the very instructive publication of Dr. Schüller. The author's task was very extensive and the accomplishment remarkable, when one notes the necessity

of coining even a part of the phraseology, necessary to emphasize the existing condition, etc., which is not to be found as yet in the medical dictionaries.

The field covered by this publication at first glance, by the reader, would be too limited. However, the numerous pathological conditions cited, prove the extensive value a knowledge of the contents would be to the internist or surgeons, as well as the Roentgenologist.

A very valuable foundation is laid for a working knowledge in the chapter on the size, thickness and shape of the normal skull

The author very clearly shows embryologically the reason why the skull attains its normal variation, as to size, shape and contour. There is also a very interesting discussion of the statiscial social and trade variations of the skull.

Under anomalies,·in the shape and size of the skull, in consequence of disturbances in its development, the reader will readily grasp the process of development, whereby the skull, necessarily, obtains the various kinds of skull anomalies, comprising the more common characteristic variations from the normal in size and shape.

Under the heading, "Skull Deformities, in Consequence of Premature Suture Synostosis," will be found a very interesting and instructive description of the ossified sutures, presenting the facts, as to the why of the irregularity in growth produced by premature synostosis.

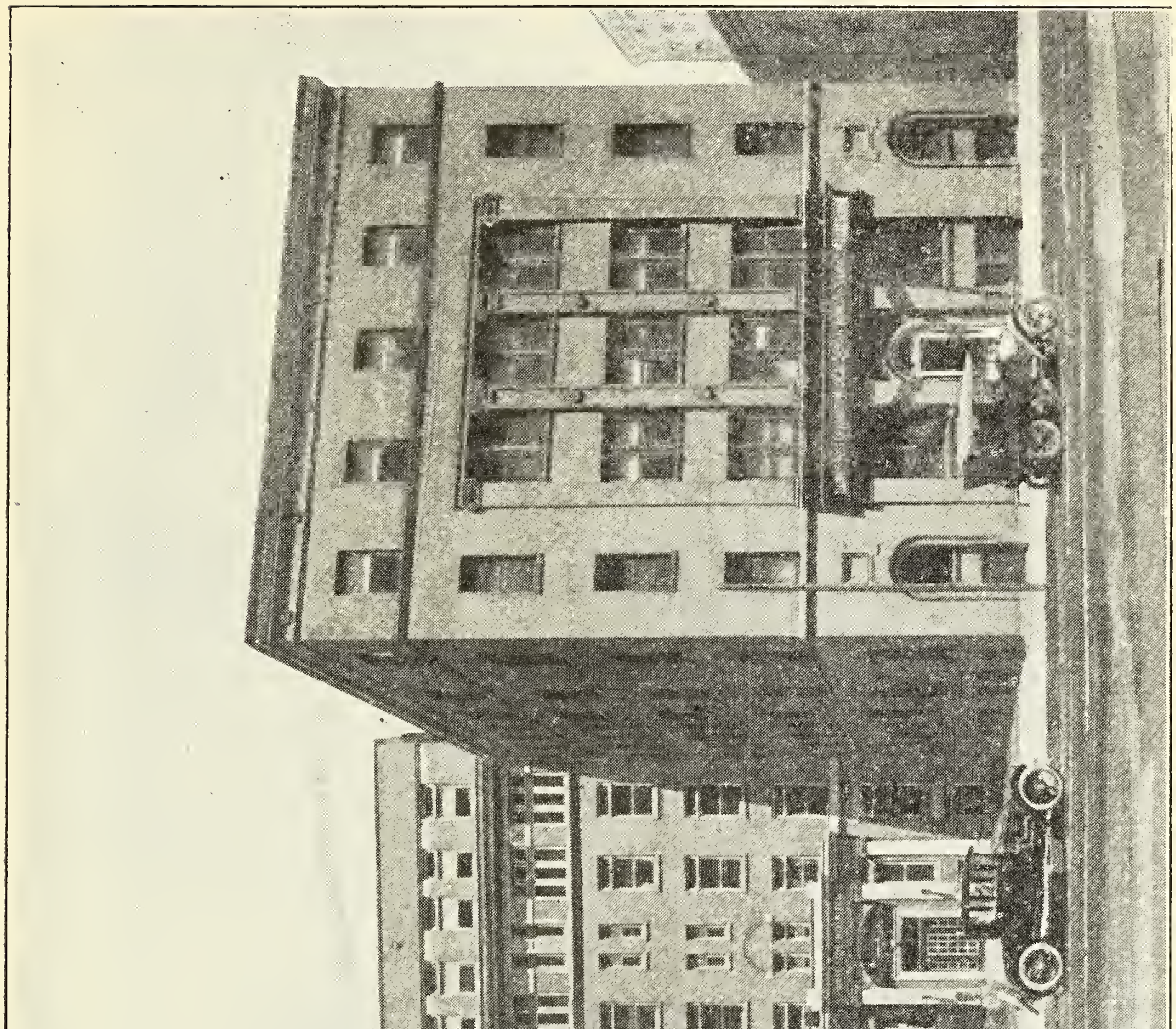
The author also very ably presents the etiology for the accompanying brain lesions, following the skull deformities.

The above publication can justly be recommended as a valuable addition to any medical library. B. A.

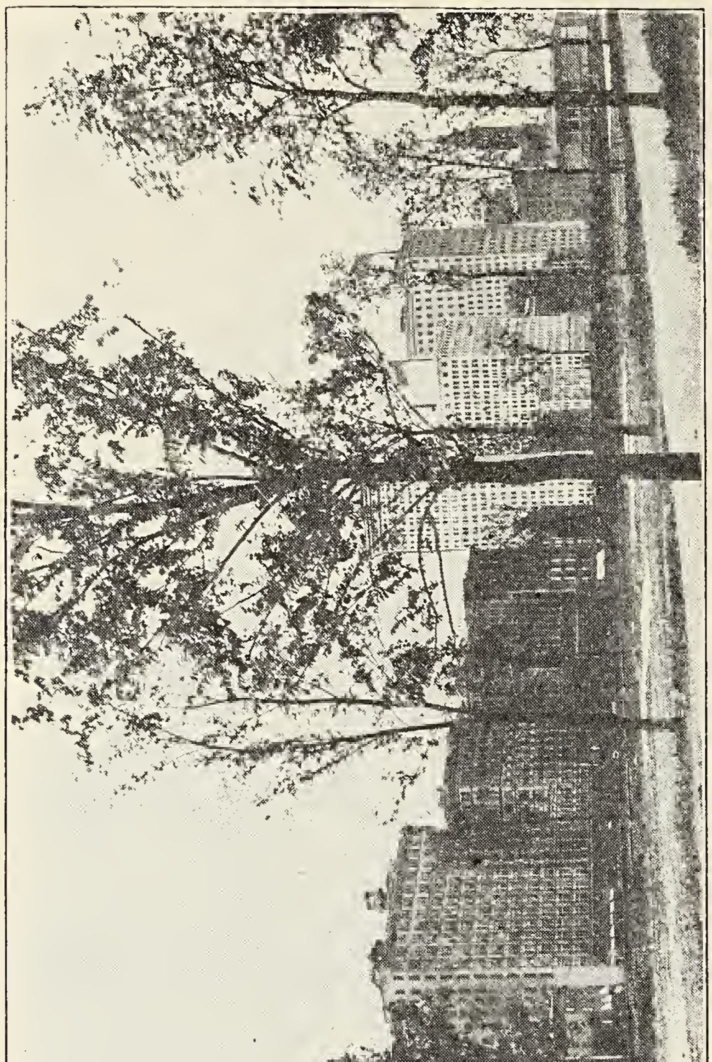
CHICAGO A CONVENTION CITY

Mrs. Ruphelle L. Trostler
Chairman of Ladies' Entertainment Committee
Chicago, Illinois

It has been said the word "Chicago" is derived from an Indian word meaning "Ship I Carry". The site represents the point on the Great Lakes where water navigation by the Indians was most easily transferred to the waters of the Mississippi. The Desplaines River being but a few miles west of the head of navigation for the Indians in the Chicago River. This fact actuated Robert Cavalier de LaSalle to one of the world's greatest prophecies in 1682 when he said, "This will be the gate of the Empire—this the very seat of Commerce." The Chicago portage was discovered in 1673 by Joliet and Marquette. The point where these men landed is marked by a monument which can be seen at the present time where Robey Street crosses the south branch of the river. Marquette passed the winter of 1674 and 1675 on the present site of Chicago. From this time on Chicago was represented by a pioneer's settlement. The first Ft. Dearborn was built in 1803. A tablet near the south end of Rush Street bridge marks the site of the old fort. John Kenzie and his family were the first American civilians to settle in Chicago, 1803. The house in which the Kenzie family resided was the first building to be erected in the vicinity of Chicago. It was built by Jean Baptiste in 1777. Their daughter Ellen Kenzie was the first white child born in Chicago. The first wedding in Chicago was Miss Kenzie's marriage to Dr. Alexander Wolcott in 1823. In 1812 the Ft. Dearborn massacre occurred. This terrible event caused nearly all the white people to stay away from



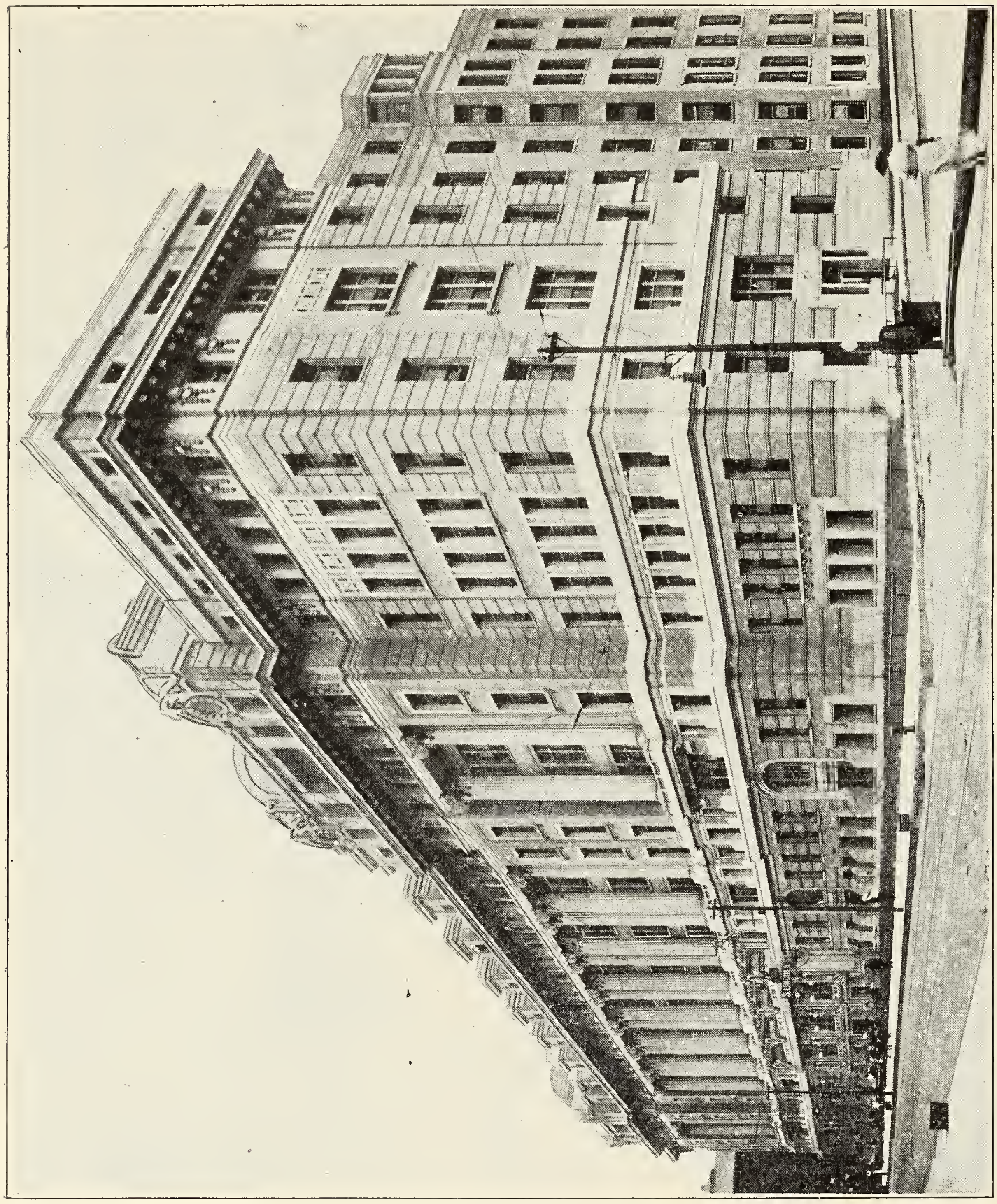
West Side Hospital and Illinois Post-Graduate Medical School



A View on Michigan Boulevard

The Home of the American Medical Association

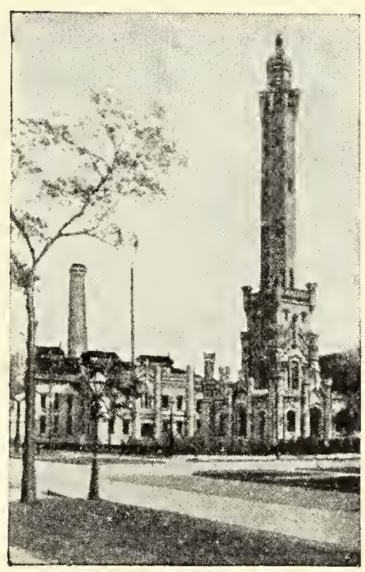
this territory until the second Ft. Dearborn was built in 1816. The site of the massacre is indicated by a monument on 18th Street and the lake front. Illinois was admitted to the Union in 1818. The first water transportation service to be established between Chicago and other lake channels was in the fall of 1818. The first slaughter house was built



The Cook County Hospital

by Archibald Clybourne in 1827. In 1832 Chicago began to ship the products of their packing houses to the rest of the world. Cook County was created in 1831. Chicago was the county seat. In 1833 Chicago was incorporated with a population of 3000. The first telegram was received in Chicago in 1848. The Illinois Michigan Canal which opened the first water transportation between the Great Lakes and the Mis-

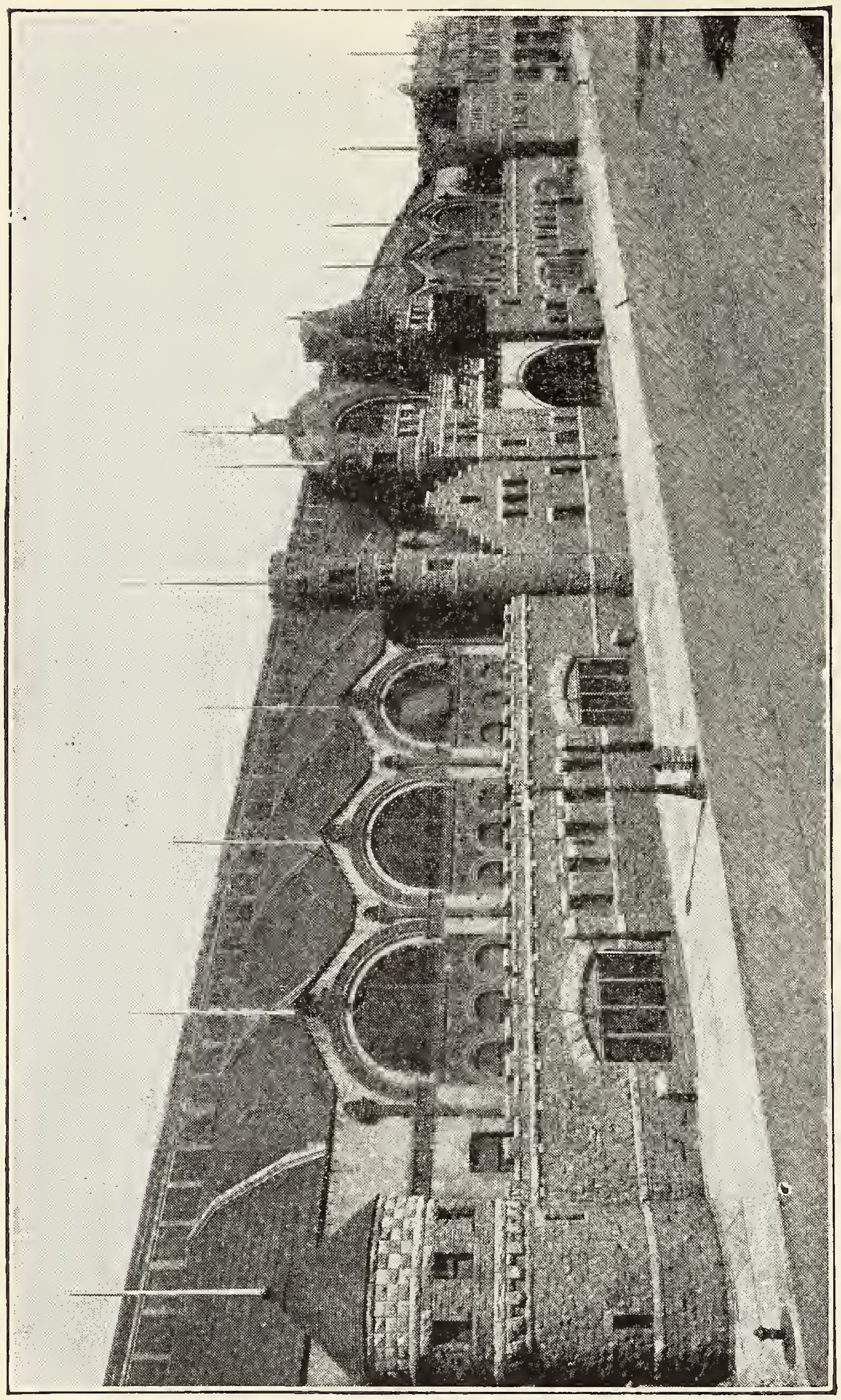
sissippi was completed in 1848. This year marks the beginning of railroad transportation—The Galena and Chicago Union. In 1839 Chicago had its first great fire with a loss of $75,000.00—ten years later the greatest storm and flood in its history destroyed many buildings, vessels, wharfs, etc. Later in the year of 1849 the second big fire occurred. In 1857 the third destructive fire occurred in which there was an estimated loss of over $250,000.00. The fourth and greatest fire in Chicago was in 1871. The fire lasted three days, covered 2000 acres of the heart of the



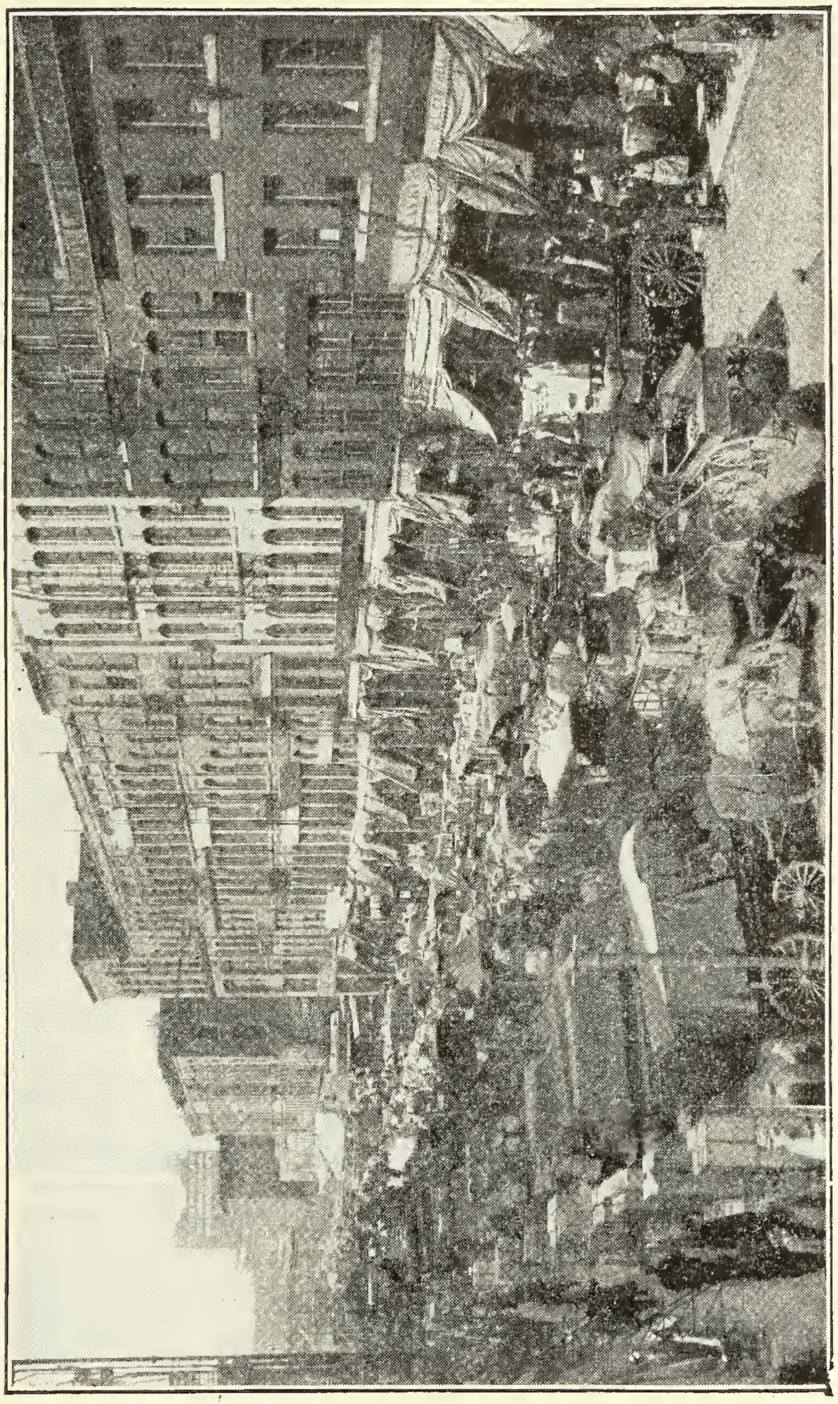
Old Water Tower (One of the Few Landmarks Remaining Unharmed After the Fire in 1871)

business district. More than 2500 stores and factories were consumed and at least one-third of the entire population left homeless. The estimated loss was upwards of $200,000,000.00. The world's first structural iron and steel skyscrapers were erected. The World's Fair occurred in Chicago in 1893. The wonders and beauty of this exposition surpassed anything of its kind ever held in the world. More than 30,000,000 people visited the exposition. Jackson Park now marks the site of the exposition and some of the old buildings are left standing.

Chicago at the present time has an area of more than 200 square miles. Western Avenue is a straight paved street



The Coliseum (The Scene of Many National Conventions)



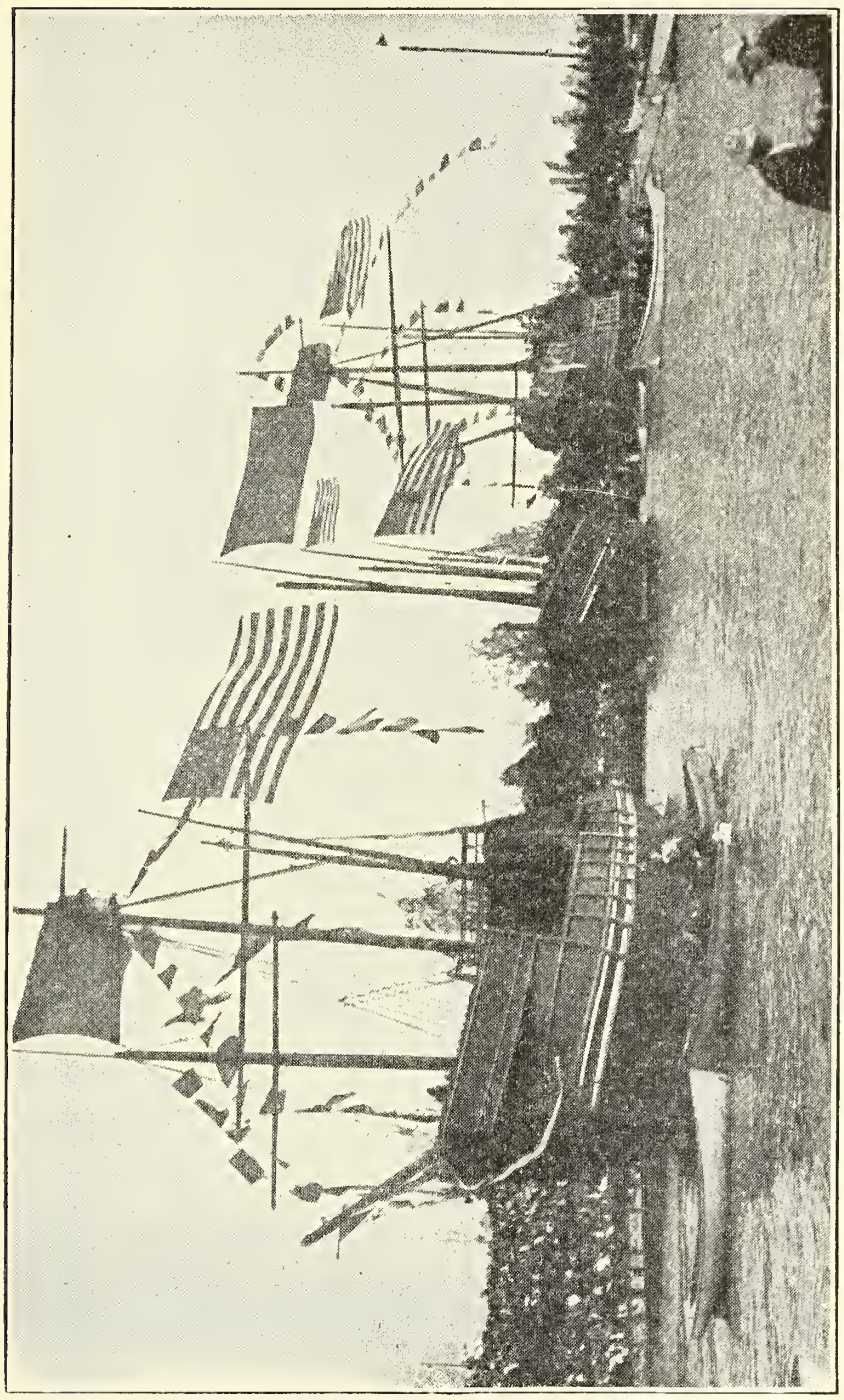
South Water Street

for 23½ miles. There are 4800 miles of streets and alleys, 1350 miles of street railway tracks. The surface and elevated lines carry more than 3,000,000 passengers daily. There are at the present time 64 miles of subway, which is used entirely for commercial purposes. The total population at the present time is something over 2,700,000.

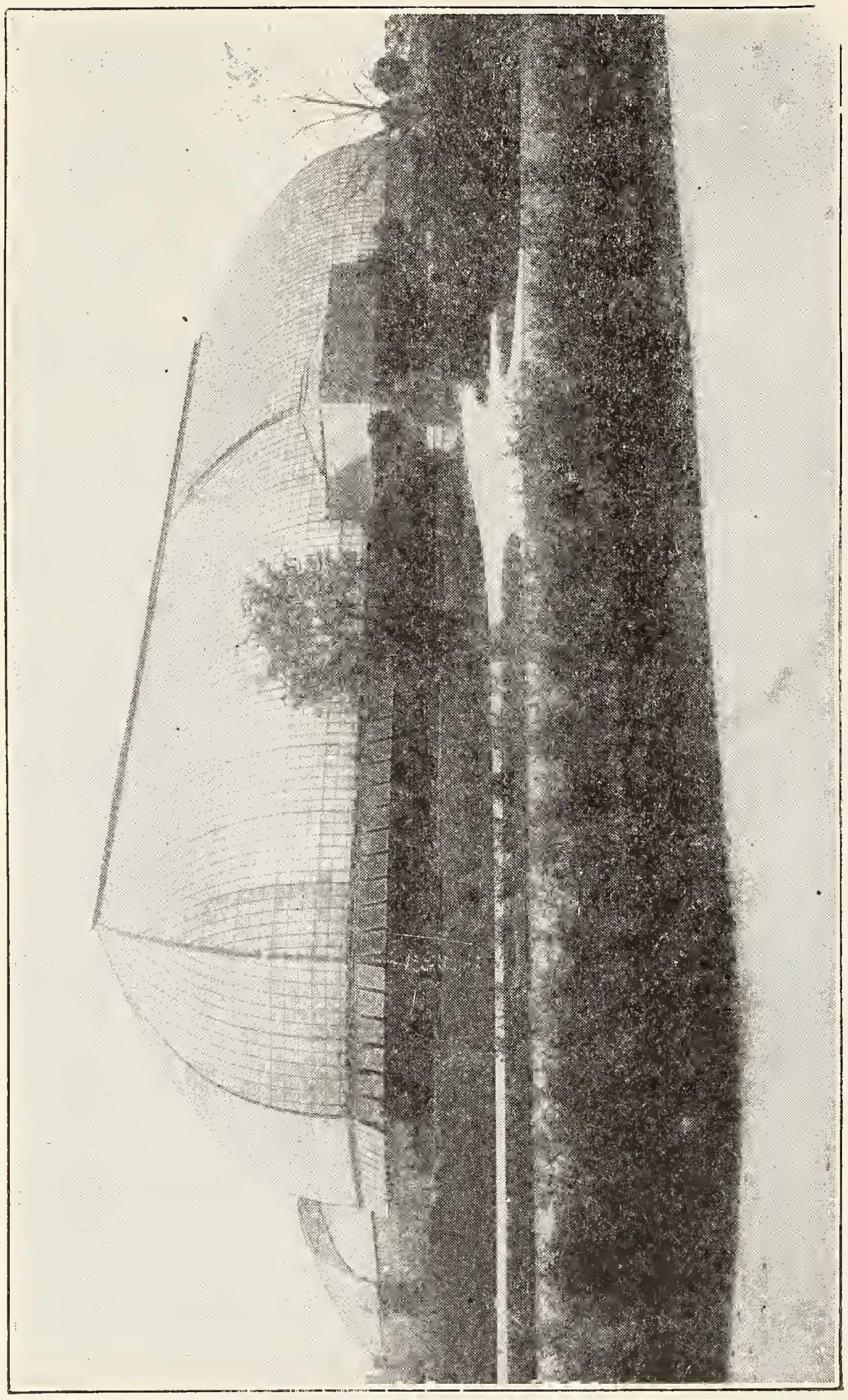
Chicago may be said to be the convention city of the United States. 610 conventions with an attendance of 520,000 delegates were held in 1917. From 1906 to 1917 inclusive there were 4317 conventions with an attendance of 3,994,000 delegates. The railroad facilities are one of the principal features contributing to Chicago as a convention city. There are at the present time 38 railroads terminating in Chicago, representing over 100,000 miles of railway or forty per cent of the railway mileage of the United States.

The boulevard and park systems are one of the most beautiful and extensive to be found in the world. This system is approximately 100 miles in length. Jackson and Lincoln Parks are the largest, containing over 500 acres each. Lincoln Park contains the largest zoo in the United States. Garfield Park contains the second largest glass roofed conservatory in the world. The fern room is said to be the largest and most beautiful exhibit of its character to be found in America.

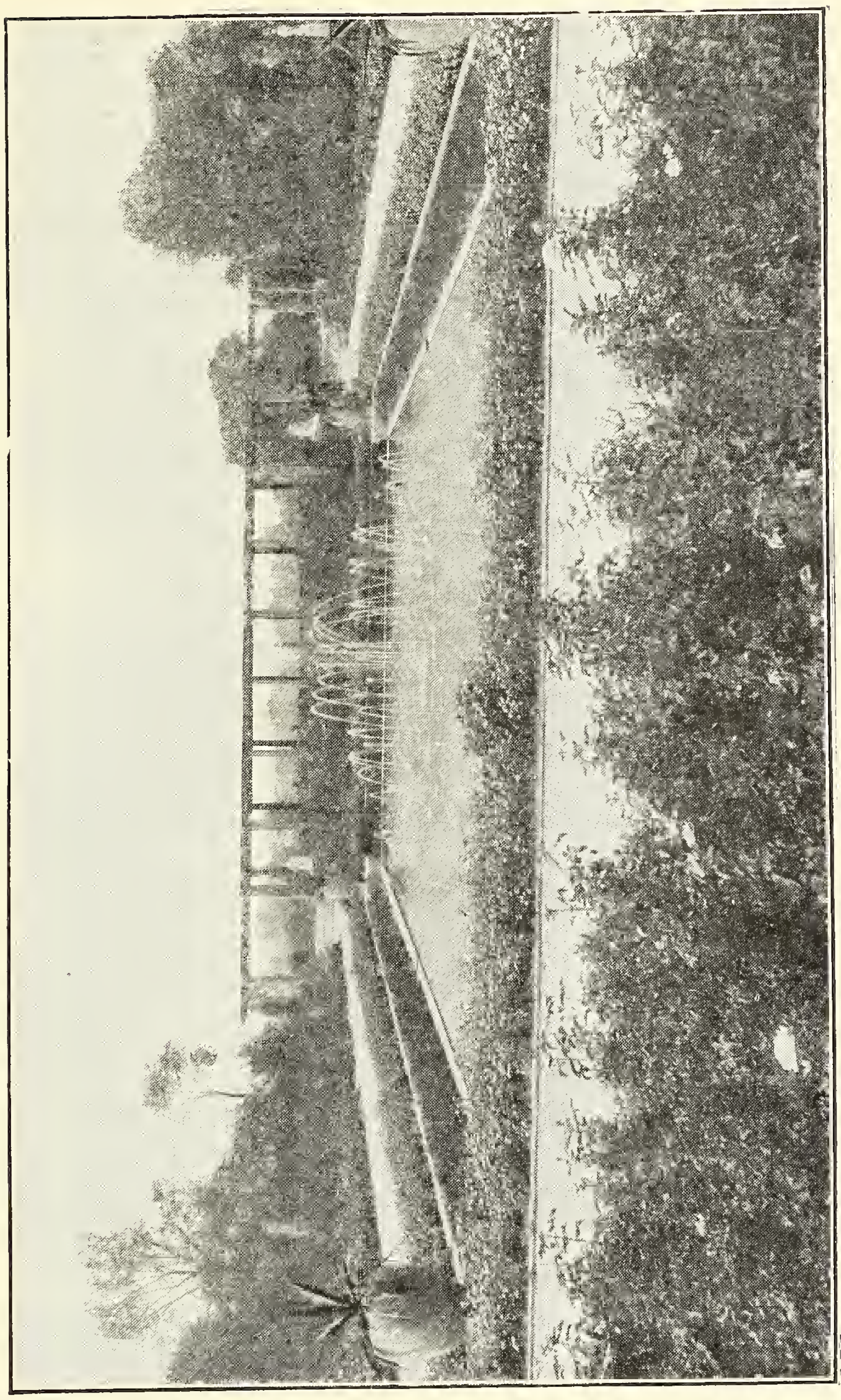
The Art Institute of Chicago is one of the most interesting places to visit in Chicago. It was established in 1879. The building is constructed of Bedford limestone. It is a beautiful example of Italian Renaissance and cost approximately $1,000,000. In addition to the many valuable specimens of art, it contains also the Ryerson library of some four thousand volumes, which is devoted to the subject of art. Another feature is the School of Art, which enrolls annually about four thousand students. Members of the Western Roentgen Society are cordially invited to visit the institute some time during the annual session.



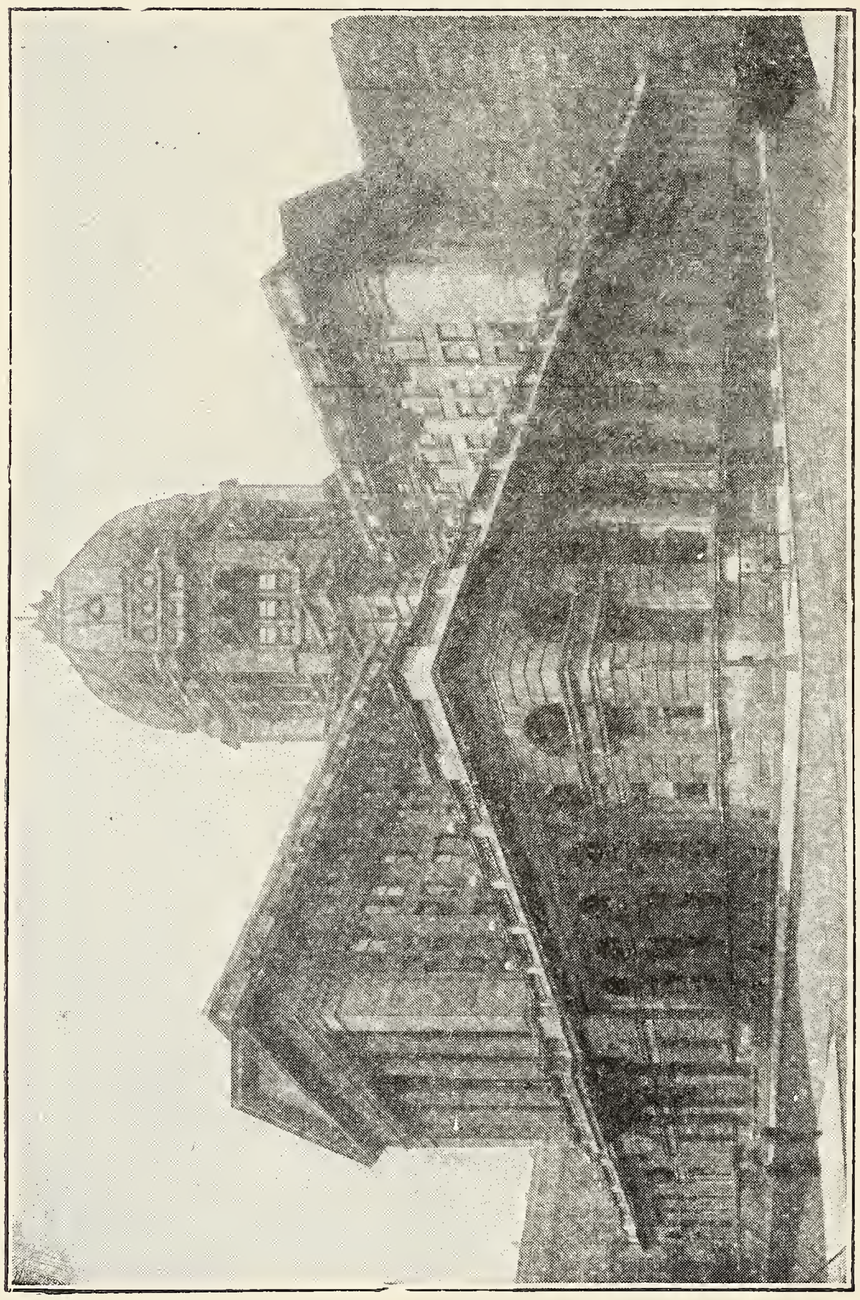
Old Columbus Boats (To be Seen in Jackson Park Lagoon and Represents World's Fair Relics)



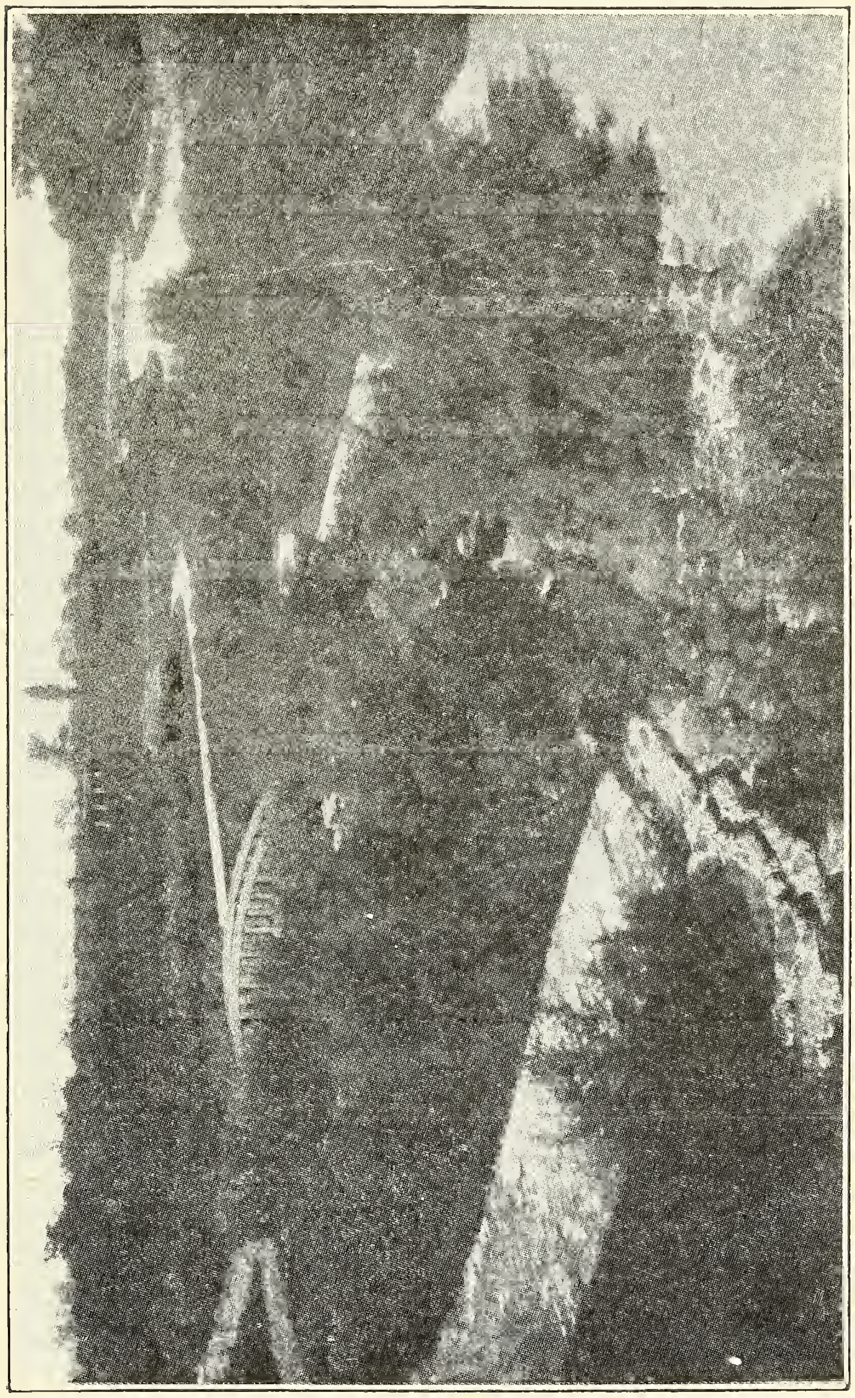
The Large Conservatory at Garfield Park



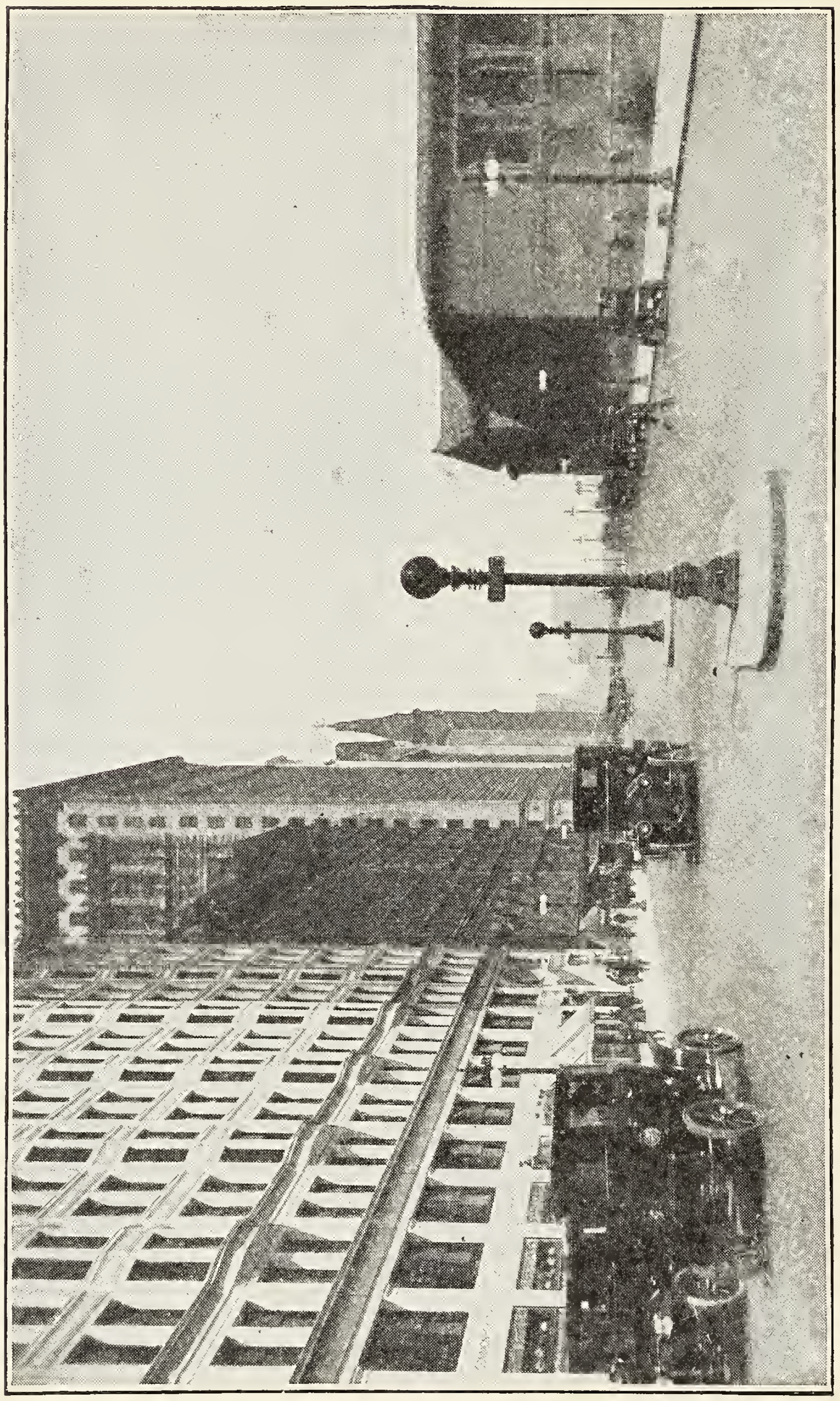
Children's Wading Pool



Federal Building



A Field Scene in Humboldt Park



Michigan Boulevard and the Art Institute

The Rialto Section or Latin Quarter of Chicago

A trip through this district of Chicago is always interesting and instructive to those who are interested in medical institutions. There are few, if any, places on the earth where so many hospitals and colleges of medicine, dentistry and pharmacy exist on so small a space.

Starting south from Van Buren on Lincoln Street we pass the University Hospital. This hospital, built in 1917, is a five story brick and reinforced concrete fireproof structure. Adjoining the hospital on the north is the splendid five story fireproof Nurses' Home. The amphitheatre building adjoins the hospital on the west along Congress Street. This hospital possesses an equipment which is new, complete and modern in every respect and with splendid laboratory and operating facilities it becomes one of Chicago's finest hospitals. The local profession holds the highest regard for the administrative courtesy and efficiency tendered the physicians as well as the patients. The Roentgen Laboratory is under the direction of a qualified Roentgenologist, Dr. A. M. Petersen.

We next pass the University of Illinois, College of Medicine. This college was organized in 1882 under the name of College of Physicians and Surgeons. After enjoying an affiliation with the University of Illinois for several years, it became an integral part in 1913. The school is now supported by an annual appropriation from the State and is rapidly becoming one of America's leading medical schools.

We next pass the West Side Hospital. This hospital is new, containing the most modern equipment, and enjoys the distinction of being one of Chicago's most popular hospitals. Adjoining it to the east is the Illinois Post Graduate Medical School. This institution is very well equipped with laboratory facilities in all lines. The relation which exists between these institutions is obviously mutually bene-

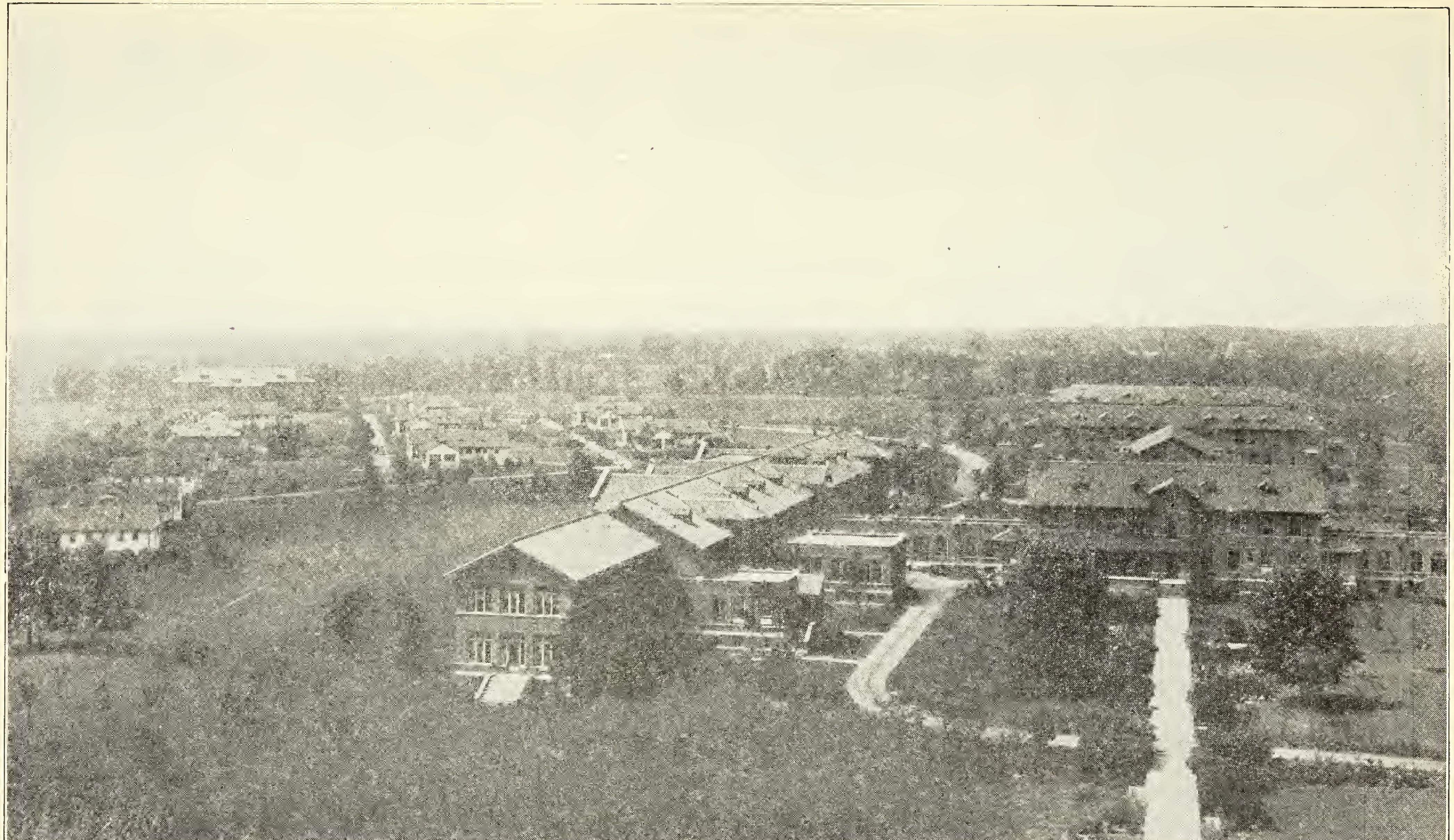
ficial. The Roentgen Laboratory is under the direction of a qualified Roentgenologist, Dr. R. L. French.

Adjoining the Illinois Post Graduate School on the east may be seen the UNIVERSITY OF ILLINOIS, COLLEGE OF DENTISTRY.

Crossing Harrison Street, we see to the east the buildings of the Cook County Hospital and on the west the buildings of the Loyola University, Medical Department.

The Loyola University now occupies the buildings of the Woman's Medical College, organized by the Northwestern University in 1870. This college became extinct in 1902. The property was sold to the University of Valparaiso, which established the Chicago College of Medicine and Surgery, which went into the hands of the Loyola University in 1917. The Loyola University is owned and controlled by the order of the Jesuit Fathers and in addition to the Medical Department, the University proper, located in a delightful campus on the Lake Shore, is rapidly becoming recognized as one of the finest educational institutions in the middle West.

The FRANCES WILLARD NATIONAL TEMPERANCE HOSPITAL was organized by Frances Willard and her co-workers who in 1903 constructed their hospital on the west side of Lincoln Street. The motive which actuated this stupendous adventure was an effort to demonstrate that alcohol serves no place in the care of the sick that cannot be attained more safely and just as efficiently by other medical agencies. This hospital was organized more than twenty years ago. The staff is in hearty accord and coöperates fully with the management and the records of the thousands of cases cared for at this institution are fully as favorable as institutions which permit the administration of alcohol. The hospital building is a splendid brick fireproof structure. It offers surgical, medical, laboratory and clinical facilities. It is connected with the Loyola University for clinical purposes. The surgical amphitheatres are among the largest



The Municipal Tuberculosis Sanitarium

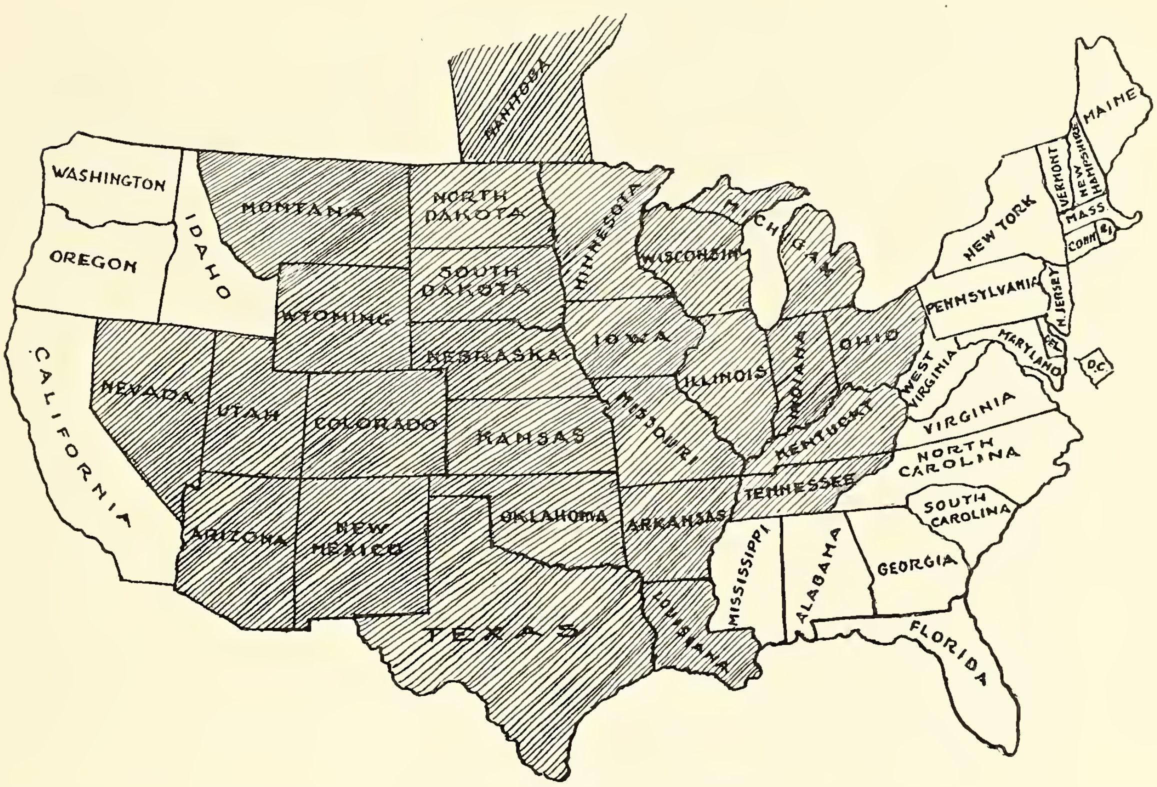
The Sherman House (Headquarters Annual Meeting W. R. S. 1918)

and finest in the city. The hospital management is invested in a board composed of ladies, who are elected by the Frances Willard Temperance Association, which insures the highest moral and professional standards in its management. The Roentgen laboratory is under the direction of a qualified Roentgenologist, Dr. B. H. Orndoff.

On the east, we pass the building in the County Hospital block devoted to acute infectious diseases.

At Polk Street we turn east and at Wood Street north. We are now traversing the third side of the Cook County Hospital block. This block contains twelve acres. The hospital was established in 1866. The space is filled with

large splendidly equipped buildings. This hospital is one of the largest institutions in the middle West. It has the capacity of almost three thousand beds. During 1917 thirty-four thousand four hundred patients were treated in the hospital and eighteen thousand six hundred and twelve in the dispensary. More than ten thousand Roentgen examinations are made annually. The staff is selected by competitive examinations held by the civil service com-



The Shaded Area in the Above Illustration Indicates That Part of the United States and Canada in Which Members and Counselors of the W. R. S. Are Located

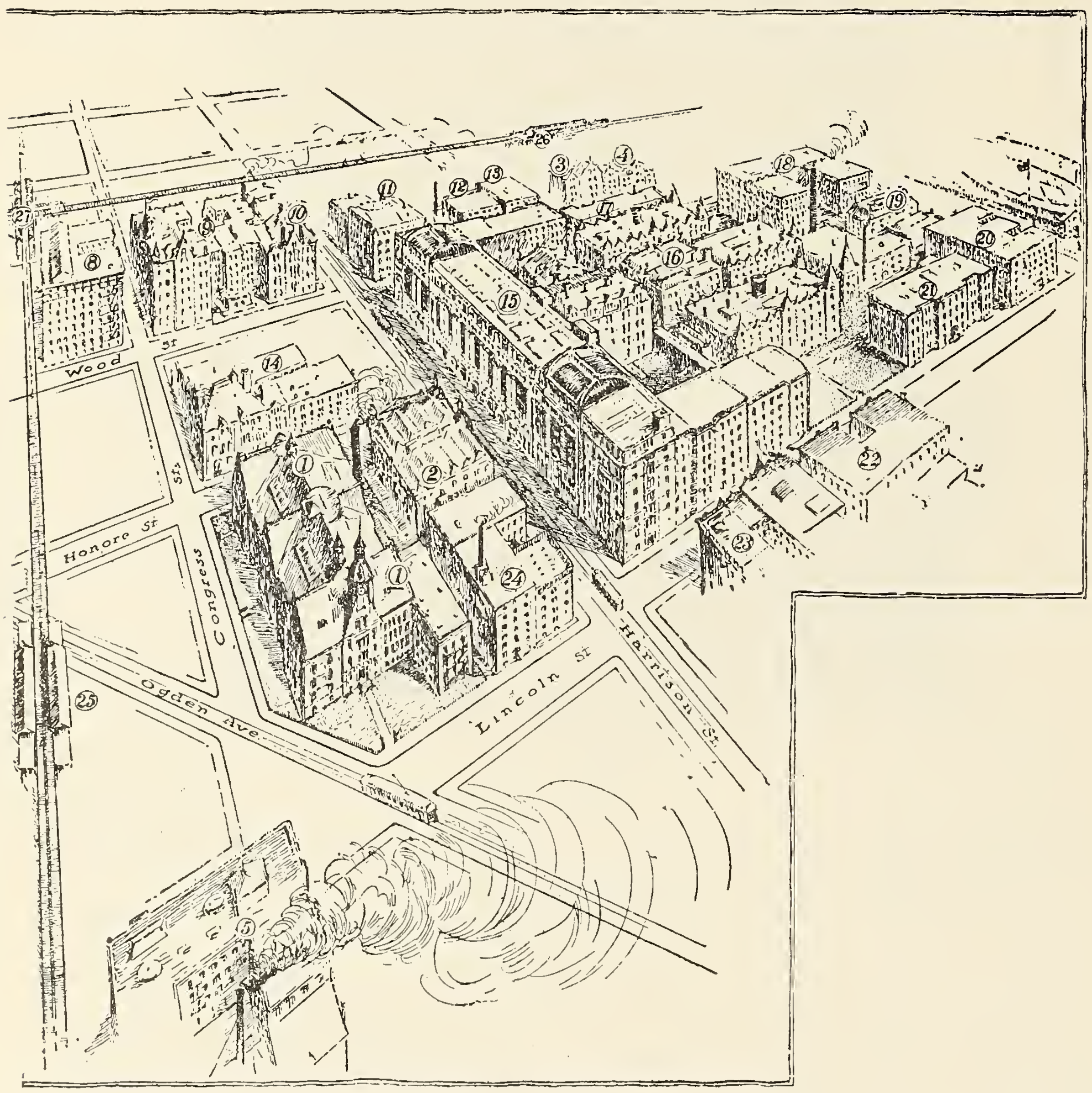
mission, irrespective of the school of practice. The principal divisions of the hospital are, in addition to the general medical and surgical departments, Psychopathic, Tuberculosis, Contagious and Venereal.

We next pass on the right the building of the old Dunham Medical College, which became extinct in 1902.

We now come to the University of Illinois, College of Pharmacy. This department of the State University with

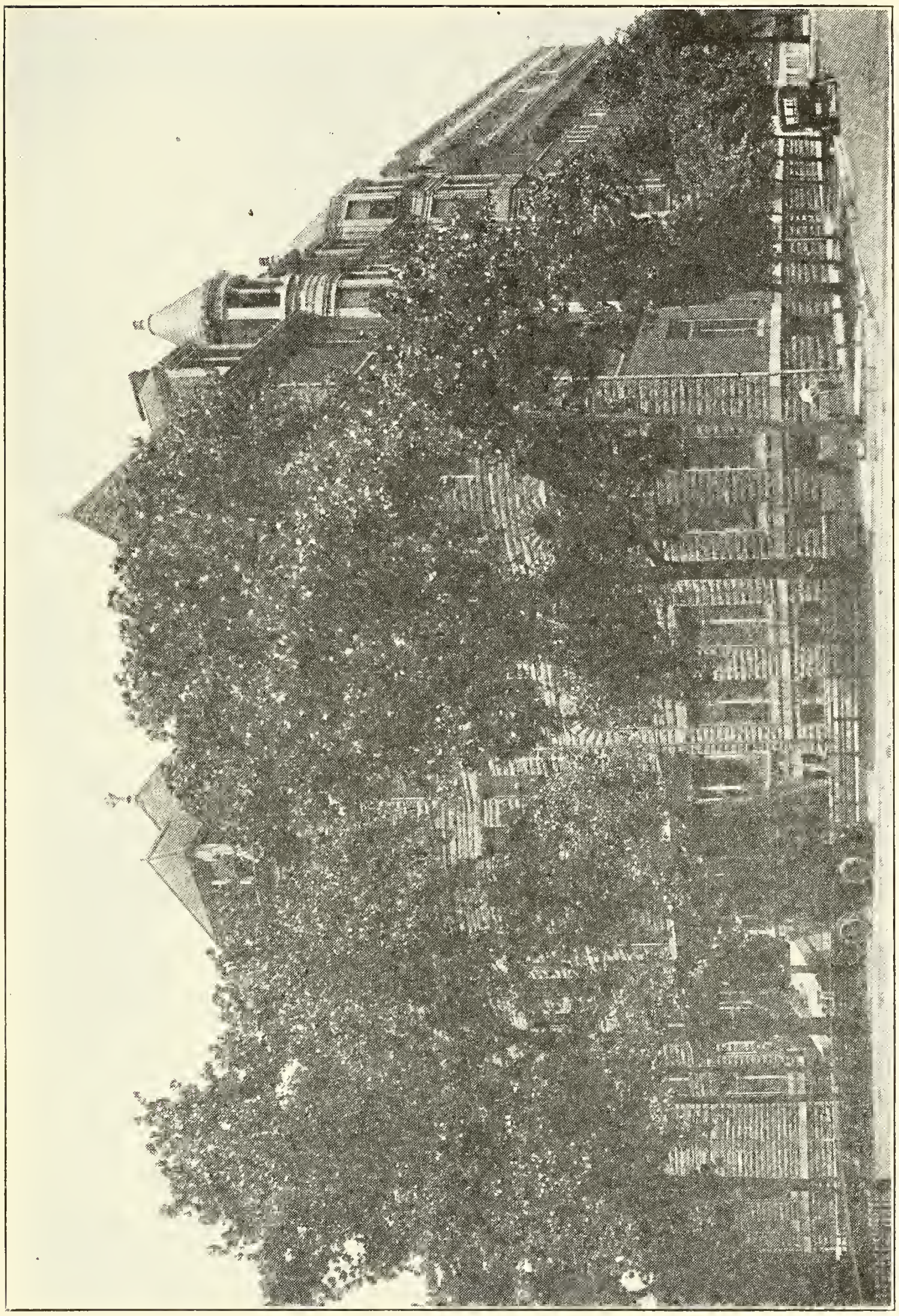
its splendid buildings and facilities is recognized as one of the leading schools of pharmacy in the West.

Farther north, we pass the ANNIE DURAND MEMORIAL HOSPITAL. Adjoining the hospital on the north is a large laboratory building, which is one of the buildings of the Memorial Institute for infectious diseases. The hospital

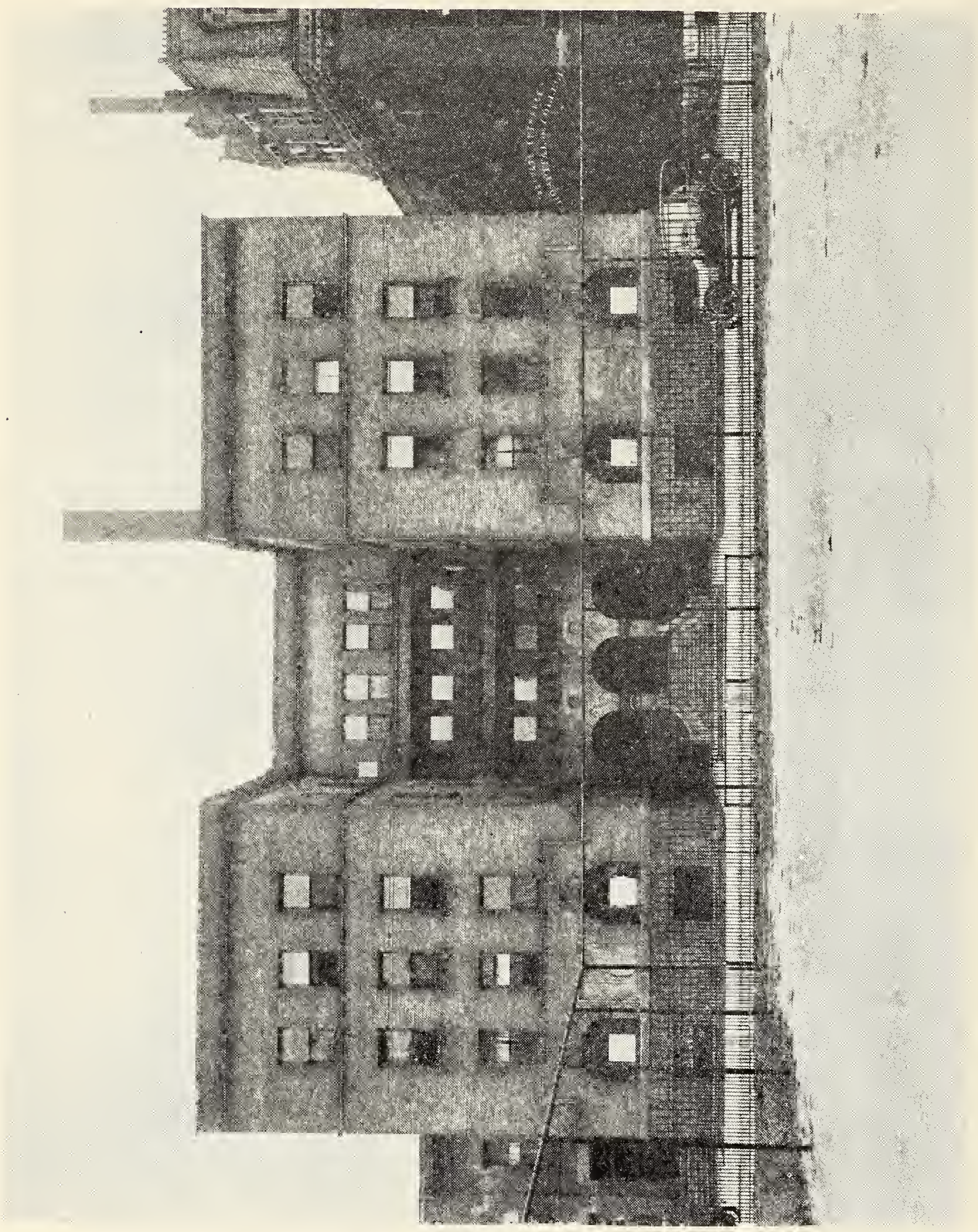


A Bird's-eye View of the Rialto or Latin Quarter of Chicago

came into existence through a bequest from Mrs. Annie Durand and has a capacity of about fifty beds. Patients receive free care. Only acute infectious diseases are accepted.



St. Joseph's Hospital



Frances Willard Hospital

THE MEMORIAL INSTITUTE FOR INFECTIOUS DISEASES possesses two very fine laboratory buildings. The institution possesses resources upward of two million dollars. The institution publishes the *Journal of Infectious Disease,* in addition to maintaining one of the most extensive research organizations in America.

Farther north we pass CHICAGO COLLEGE OF DENTAL SURGERY—dental department of the Valparaiso University. This institution, founded by Truman W. Brophy, has long been recognized as one of America's most prominent dental colleges.

Crossing Harrison Street on the west, we find the building of the old Marquette School, which is now used by the government as barracks.

On the east, we see the building of the RUSH MEDICAL COLLEGE. This institution was founded by Daniel Brainard in 1837. Because of its affiliation with the University of Chicago, the freshman and sophomore years were given at the University on the south side. The present plans call for the construction of a large hospital at the University, the transfer of the entire undergraduate teaching to the University and the organization of a post-graduate school in this building.

Adjoining the building on the east is the five story SENN MEMORIAL BUILDING.

Adjoining the College to the north is the PRESBYTERIAN HOSPITAL. This hospital is one of the largest and finest hospitals in Chicago. It is connected with Rush Medical College for clinical purposes.

Scattered over the various districts of Chicago there are located many very fine hospitals. The telephone directory at the present time lists approximately 100. It would be impossible to give within the scope of this article information of interest to medical men for more than a few. ST. JOSEPH'S HOSPITAL is noted as the home of the celebrated surgeon, Nicholas Senn. Members of the W. R. S. may

be interested to know that it contains one of Chicago's finest Roentgen equipments and that it is under the direction of the well known Roentgenologist, Dr. I. S. Trostler. St. Mary's, St. Anthony, Augustana, The North Chicago, Norwegian Deaconess, St. Luke's, Michael Reese, and Mercy Hospital are among Chicago's largest and best hospitals and for the most part possess a qualified Roentgenologist on their staff.

One of the most interesting institutions in the city for the Roentgenologists to visit is the Chicago Municipal Tuberculosis Sanitarium. It is located on the northwest side of the city in a large and well arranged tract. It was made possible, first, by the passage by the Illinois Legislature of the Glackin Act "to enable cities and villages to establish and maintain public tuberculosis institutions", which became effective July 1, 1908, and, second, by the acceptance of this Act by the city of Chicago at the election held in April, 1909.

The Act, as amended, provides for a one-mill tax, which gives the Municipal Tuberculosis Sanitarium approximately one million dollars annually to be expended in the campaign against tuberculosis.

About two million dollars of this has been used in constructing buildings, including a large infirmary and eighteen cottages, giving the Sanitarium a capacity of approximately one thousand beds.

In addition to the hospital proper, eight dispensaries are maintained in various parts of the city for the treatment of tuberculous patients in the field, approximately 25,000 of whom are carried annually.

The Roentgen division of the staff consists of a resident Roentgenologist and one or more consulting Roentgenologists.

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DECKER, CAPTAIN H. M. Fort Oglethorpe, Georgia.

WALLACE, CAPTAIN JOSEPH F. General Hospital 21, Denver, Colorado.

ENFIELD, LIEUTENANT CHARLES DARWIN. U. S. A. Navy.

BRIGGS, CAPTAIN G. C. U. S. A. Navy.

ULTES, LIEUTENANT WILL. U. S. A., Fort Oglethorpe.

FRANING, CAPTAIN E. C. Galesburg, Ill.

MOES, LIEUTENANT M. J. U. S. A.

MCCOY, LIEUTENANT JAMES N. U. S. A.

SALA, LIEUTENANT E. M. U. S. A.

TUCKER, LIEUTENANT E. A. U. S. A.

CHAMBERLIN, LIEUTENANT A. R. U. S. A.

BACCUS, LIEUTENANT C. F. U. S. A., in France.

TRACEY, LIEUTENANT F. R. U. S. A., in England.

MCDEED, CAPTAIN W. G. M. S., Base Hospital, Camp Lee, Virginia.

STOTTS, MAJOR A. F. U. S. A., Barron Field, Everman, Texas.

BORTZ, CAPTAIN J. A. M. C., Receiving Group, Infirmary Four, Camp Joseph E. Johnston, Jacksonville, Florida.

The above list of members of the Western Roentgen Society in various branches of the Army and Navy include all that we have been able to locate to date. A few of the addresses given are doubtless incorrect, and we would appreciate any additions, corrections, or changes of addresses with which you may be able to supply us.

THE JOURNAL OF ROENTGENOLOGY

Published by the Western Roentgen Society, Inc.

VOLUME I   Fourth Quarter, 1918   NUMBER 4

CONTENTS

THE JOURNAL OF ROENTGENOLOGY is the official publication of the Western Roentgen Society, Inc., and is published under the authority of the Society.

Address communications and manuscripts for publication to the Editor, Dr Bundy Allen, Iowa City, Iowa.

Subscription rate—$5.00 per year, $1.50 per copy.

Application for entry as second-class matter at the post office at Iowa City, Iowa, pending.

EDITORIAL

"A large number of us have worked hard during the war and have done good service." This statement as was made by an "old line" journal is very well said.

As the Journal of Roentgenology was born during the war Nineteen Eighteen, it probably could better be said that a small number have worked hard during the war and as this, the fourth number, concludes Volume One of the Journal we herewith submit this volume for your approval and answer as to whether or not good service has been rendered.

If the W. R. S. could publish a volume—which was done and probably could be called a more or less successful one—in the year Nineteen Eighteen, encountering averse conditions from almost every angle, *viz.,* The majority of the progressive material being absent serving the colors, which fact would of course make copy not so plentiful, and the exceptionally high cost of material, etc., etc., making up some of the difficulties, Volume Two should be a very much more successful number.

Now that the war is over it is possible to "get down to earth" and with just a little boost from the united membership, as a whole the future publications should be a success and a credit to the personnel of the Western Roentgen Society.

B. A.

"SLAMS OF LIFE"

When your back is broke and your eyes are blurred,
And your shin bones knock and your tongue is furred,
And your tonsils squeak and your hair gets dry,
And you're dog-gone sure you're going to die;
But you're skeered you won't and afraid you will,
Just drag to bed and have your chill,
And pray the Lord to see you thru,
For you've got the Flu, boy, you've got the Flu.

When your toes curl up and your belt goes flat,
And you're twice as mean as a Thomas cat,
And life is a long and dismal curse,
And your food all tastes like a hard boiled hearse;
When your lattice aches and your head's a-buzz,
And nothing is as it ever was,
Here are my sad regrets to you—
You've got the Flu, boy, you've got the Flu.

What is it like, this Spanish Flu?
Ask me, brother, for I've been thru,
It is by misery out of despair,
It pulls your teeth and curls your hair,
It thins your blood and brays your bones,
And fills your craw with moans and groans,
And sometimes, maybe, you get well,
Some call it Flu—I call it Hell.

THIS PAGE WILL BE GIVEN IN EACH ISSUE OF THE JOURNAL FOR ANY SPECIAL ANNOUNCEMENT THAT THE PRESIDENT OF THE ORGANIZATION MIGHT HAVE FOR THE MEMBERS OR THE READERS.

To the Readers of the JOURNAL:

In the past two decades the science of Roentgenology has suffered much from isolated effort on the part of the individual worker. Seldom has there been found more than one or two laboratories in the larger civic centers. The natural consequence was lack of stimulation to do research work or compile statistics.

A return to peace and the return of a large number of better trained older workers with the new army-trained men, presents a problem of vital interest to us as an organization. These men return with a new training, the products of which will be utilized in their new laboratories. They have learned the value of coöperative study under some of the best minds in Roentgenology in Europe and America.

They have learned to see the plate, the screen and the patient through the eyes of conservative, experienced teachers, where sufficient time has been given during the academic stage of their work to coördinate the findings.

In greeting these returning men we have more than a welcome: we have in a new section of the Constitution, under the article regarding membership, a provision for "members elect" who, upon their return may affiliate themselves with the Western Roentgen Society in a way that provides for them all the privileges of the Society except that of holding office.

The time of army service in Roentgenology accrues to the probationary time for full membership qualification; hence we acquire the fullness of their enthusiasm, also they

have the support of a strong body of organized workers. Affiliation with their local and State Medical Societies will obviously be one of the first steps taken by the younger men. Therefore, full membership will soon be granted to the class of men most valued by us, and to whom we hope a coördinate benefit may accrue from the meetings and from our publications.

In welcoming their contributions to the JOURNAL, it is with the feeling (so splendidly expressed by our retiring President) that development is much encouraged by the preparation of their ideas for presentation and publication; thus reaping the benefits of constructive criticism, receiving credit due them for priority in ideas and thereby enriching the field of endeavor nearest our hearts.

In fulfilling this spirit of welcome it falls to the lot of the State Counselors and Provincial Counselors of Canada to organize local informal Roentgen clubs which shall include the reputable members of the profession engaged in this work and report to the secretary of the Western Roentgen Society the proceedings and valuable contributions submitted to these local units.

O. H. McC.

PRESIDENT'S ADDRESS

Fourth Annual Meeting, Western Roentgen Society
Chicago, November 20, 21, and 22, 1918

I have the pleasure of recognizing one privilege, at least, which no president of the Western Roentgen Society has yet enjoyed, and that is to welcome the members to his own city for the Annual Meeting.

It is almost needless to say that in view of the conditions brought about by the war, the recent epidemic, etc., our local men will not be able to show the same degree of generosity in entertainment accorded Annual Meetings in the past. The local work of final arrangements for both the scientific program and the scientific exhibits, social and entertaining features, have been greatly altered and delayed by the unavoidable inaptitude necessitated by the ravages of the recent epidemic of influenza, which almost prohibited our meeting on this date. It has been extra effort indeed that has succeeded in consummating what we have to offer.

My entrance into the bonds of duty of this office last January found me quite without preparation and in my judgment almost without qualifications. However, this must pass now as another "Military Necessity" or whatever excuse may seem euphonious.

Of the many urgent problems before us at this time, the one paramount was, of course, to ascertain our proper field of endeavor in the support of the great National military organization, which our Nation was fast becoming. Modern warfare is prosecuted not only with well organized armies but rather with well organized Nations. Every Roentgenologist realized that the war was to us a negative or positive test for existence. Our government and our

people were no longer confused as to our place, our duty or our loyalty. We had all waited patiently and enduringly for rational explanations of Germany's refusal to attempt a peace settlement before opening hostilities, her outrage of Belgium, invasion of France, support of inhuman atrocities, sinking of the Lusitania, and "the murder of the nurse Edith Cavell". Then came the unfolding of plots to embroil America in war with Mexico and Japan, while we were at peace, as revealed by Prince Lichnowsky, German ambassador to England. Finally we found ourselves squarely face to face with a strong people and government whose insane ideas lead them to believe that it was their mission and privilege, as God's chosen instruments, to spread their "Kultur" to the world. To this end they effected a fearful combination of science and efficiency, which could only be checked and broken by one more powerful. Nation after Nation was brought to feel the insult of the mailed fist. Nation after Nation protested in vain the loss of the lives of their citizens and their property. Neutral Nations, peace loving Nations, are not quickly convinced, but these outrages were deliberately repeated. No cessation seemed possible until twenty Nations were embroiled in war. No matter what excuses have been or will be offered concerning causes for hostilities in Europe, the German people and their government are responsible for America's entrance.

Now, the active war has ceased. Execution of the terms of the armistice is in progress. Communication has been reëstablished somewhat with the German people. Censorship has been lifted. Do we hear the wailings and regrets of a people, who have been led by a heinous dictator to commit the most infamous crimes of the age? Is there a sign of repentance for the sinking of the Lusitania, the murder of Edith Cavell? No—not one. There is, however, instead, a strong rank aftermath of anger against those who betrayed Germany into *an unsuccessful war.*

The people of Germany believe, in my judgment, as thoroughly as ever in the supremacy of might. While they have laid down their arms temporarily, at least, they have not been able to judge with open minds the frightful position their deeds have forced upon them. Seven republics have already been formed out of these peoples and others in the state of formation. It is our duty now to assist them to understand and adopt the true virtues of democracy.

Until such time as they may find themselves in full accord with broad, free democratic principles of government and have made themselves understood by the free born people of the world, they can never be extended the right hand of the fellowship of science, that has been so freely interchanged in days before the war.

Upon assuming the responsibilities of office last January, I attempted to ascertain the present status of Roentgen organization in the Army. It was my hope that during this year our organization might serve its fullest function to its Roentgen division as well as to our members. The results of my investigations were indeed very gratifying. I found that this organization really had its inception before the war was declared. The American Roentgen Ray Society, as an official body, undertook the first steps, and later presented themselves and their developments to the government. A division of Roentgenology was quickly established and there was appointed as its leader a man whose sense of honor, equity, and thorough efficiency cannot be questioned, Colonel A. C. Christie. He at once manifested wisdom by surrounding himself with the strongest men of the country available for military service. Since the days of the inauguration of this division until the close of the war certainly none can give better account of their work. Time will not permit me to speak in detail of the many problems that were mastered in this division. It is sufficient to say that one of their greatest problems was the developing of a School of Roentgenology. After going through many

phases in the construction of this organization, the results finally obtained at Ft. Oglethorpe under the direction of Colonel Willis F. Manges will serve as a monument to him and those in charge of the Roentgen division.

One unfavorable thing I learned at this time was an impression that had become prevalent throughout the West. It was to the effect that unless a Roentgenologist was a member of the American Roentgen Ray Society, he could scarcely expect to receive a commission and an assignment in the Roentgen division. Second—little, if any, consideration would be given his qualifications in view of an advanced commission. My investigations found this impression to be based upon several things, among which were remarks of disregard reported to emanate from officers and members of the A. R. R. S., and the fact that when the officers of the A. R. R. S. decided it was necessary to recruit further resources than that of their own members, they ignored totally the fact that the W. R. S. was in existence when they must have known that its membership at that time totalled approximately that of their own. I felt keenly the sting of these conditions. I considered them unjust and when I learned that members of our Society were entering the service and avoiding the Roentgen division for these and similar reasons, I decided that I could serve my office no better than to see these Eastern men personally and endeavor to learn if those in charge of the Roentgen division at the Surgeon General's office were of the same opinion. Consequently, I made a trip to Eastern states, including Washington, and obtained first hand knowledge.

My discussions of this subject proved to be satisfactory, especially with those in Washington. I learned positively that no matter what conditions existed previously, the Roentgen division was in need of qualified Roentgenologists and applications for commissions from members of the W. R. S. would receive exactly the same consideration extended members of the A. R. R. S. As a result of this

information, I have attempted through the mail at various times and at our meeting in Colorado Springs and through the agency of our Journal, to keep our members in close touch with the urgency of the Army's demand for us. In fact, I had prepared my last attempt before leaving this office, at this annual meeting to induce further enlistment from our membership. My announcement in the last issue of the Journal is a part of my program. As an evidence of my earnestness I was entering the service myself. Now, within a fortnight, the tides have changed. The demand for Roentgenologists in civil practice already great will rapidly become more apparent and in my judgment will be far greater than that of the Army from this time.

At no time in America's history has the medical profession been called upon for greater sacrifice than during this war. Approximately one-half of the active profession were required by the government to serve the great army in the field. The duties assumed by the medical men in uniform were very largely the rapid consummation of an organization capable of handling successfully all the medical necessities of the Army and Navy in active warfare. The Army Medical Corps as they stand to-day mark that point in human achievement never obtained in all history. Not only is this true of the magnitude, character of the personnel, medical qualifications, superiority of equipment, efficient organization in all branches (especially including Roentgenology), but the short time consumed in its construction, is clearly unprecedented and was considered impossible. The writer realizes fully the sacrifice required of the medical man who remains at home. The recent epidemic reached proportions at its climax which would have taxed the full profession in peace times. Every physician able to enter active duties was pressed to his physical limit. Men who for some time had entered special lines returned temporarily to general work in order to supply the public emergency.

Our Annual Meeting, occurring at this time, is undoubtedly not favored by the presence of many who feel these demands sufficient to warrant their remaining at their local posts of duty. I wish to point out that the exigencies of these times rendered the necessity of attendance at society meetings both local as well as special, by those of us not in service, more urgent than ever in the history of the organized medical profession. At the same time, I appreciate we have not and cannot make the sacrifices exacted from our physicians in uniform. We, nevertheless, are expected to maintain all sections at the home defense lines. Our vigilance in maintaining the organization as exemplified by our interest in attendance and activity at our Society meetings must be strengthened rather than relinquished if we do our full duty for our brothers in uniform, our clientele and ourselves.

This war is from all standpoints waged for the principle which signifies benefit to all humanity. Physicians who supported it by maintaining to the fullest degree of application to duty, not counting the sacrifices, should be known and honored whether at home or in uniform.

Occasionally we may hear the fact whispered that physicians who have not been able to enter active service will by virtue of military medical organizations, after the war, have no place in medical politics and will not enjoy the privilege of equality with those whose sacrifices have been in uniform. It seems well to quote in part a recent editorial in a daily paper as it bears forcibly on this point. "If there is a soft berth within the gift of the people, who is better entitled to it than the Yank, be he medical or otherwise? What better could we do than to give him the opportunity to dry the trench water from his feet from the top of a mahogany table in a warm steam heated chamber? Therefore, we may anticipate the day when a straight-backed, full-chested, broad-shouldered, level-eyed young fellow anywhere between 21 and 45 steps into your office

with a card, possibly his photograph on one side and on the other side, something like this: 'John Jones ————, candidate for ————, inducted into military service July, 1917. Decorated at Chateau Thierry for bringing in ten Huns single handed. Wounded at St. Mihiel. Decorated at Metz for conspicuous bravery on the field. In the first American division to cross the Rhine. Discovered and captured the Crown Prince (Willie the rat). Distinguished as a Red Cross nurse in a rathskeller in Liepzig. Helped to ornament the famous trees of Unter den Linden with hemp and junkers, and ex-submarine captains. Member of the guard who escorted Kaiser Bill, Ludendorf, and Hindenburg to the coast en route to St. Helena. ———— Respectfully solicits your vote.' ———— Would he get it? We think so, also that he would get his proportion of the votes of the other five million Yanks. Their fathers, mothers, wives, sweethearts, uncles, aunts, nieces and nephews, all of whom by that time will cast a ballot."

Among the problems confronting Roentgen organizations at this time is that pertaining to the technician and manipulators. Shall we encourage the technicians to organize themselves? The manipulators in still another organization? Roentgen manufacturers in possibly another organization and as has been recently drawn to my attention a possible organization affiliated with the American Physical Society enrolling physicists, roentgenologists, physiologists, etc., or one Roentgen organization providing for them all. This problem is of profound importance and I would like to recommend that the succeeding president of the W. R. S. appoint a committee on Roentgen organization to consider and report upon these various problems of organizations and I would also suggest that they work in close touch with our committee on constitution and by-laws. I would like to recommend that the president use his best efforts in the support of his good office to materialize a united roentgen organization for America.

One of the problems undertaken during the year was the publication of a JOURNAL by the Society. This involved an outlay of much expense, time and effort. Considering the number of our most active members in service, the work of necessity has fallen on comparatively few. Too much cannot be said in return for the untiring efforts of Dr. O. H. McCandless in this matter. He was able to enlist enthusiasm for the adventure at all times. His efforts in this undertaking have meant an expenditure of money and time, which but few of us realize. Dr. Titterington, our previous president, was also active and helpful with the early work. Dr. Trostler, as chairman of the publication committee, and Dr. Ballard, chairman of the executive committee, have both given freely to the cause. The brunt of the work, however, has fallen to the editor, Dr. Bundy Allen. It is only fair to say that the meritorious qualities characterizing the three first issues is due to a very large extent and is to be credited to his splendid ability. The Society may well feel proud to have as a member one so capable in this regard at this time.

Some problems in reference to our JOURNAL have developed, which were not anticipated. The color of the cover on the first issue was found objectionable by the publisher of another Roentgen journal. Our Society had already adopted gray and blue as their standard colors, so the conflict of the tint of color on our first journal was the result of the fact that war conditions rendered sufficient amount of gray paper unavailable at the time the JOURNAL was going to press. When the final issue of our JOURNAL for this year is published, I am confident that the JOURNAL will stand attest of its place in the annals of the science of Roentgenology.

Another of the problems confronting American Roentgenologists of to-day is a National Organization. To say that such an organization is already in existence would be wrong, when we consider that there are in existence more

than one-half a dozen separate organizations, the two largest ones having a membership of approximately two hundred each, that either one would claim considerable less than 10% of the total number of qualified Roentgenologists of this country. The membership of each Society is geographically centered in their respective sections of the United States. Finally there is no working coöperative union established between these societies. Dr. Allen has drawn attention to this fact and elucidated very concisely a possible solution for the situation in an editorial appearing in the October edition of the JOURNAL OF ROENTGENOLOGY. I would like to recommend that the incoming president attack this problem with an idea of culminating a union between these already existing units. It is obvious that if such a union could have existed prior to this war it would not only have proven to be highly satisfactory to its members, but at the same time an asset to the Roentgen division of the U. S. Army. We would also be then in a position to ask for a section in the American Medical Association.

Time again calls me to be brief and I will not discuss further details of the problems confronting our organization other than to mention the problems of nomenclature, ownership of roentgenograms, can the patient demand the Roentgen report from the roentgenologist when referred to the latter by a physician, standardization of protective materials, standard filtering materials for therapy, the advisability of adopting a uniform size of transformer, decision as to the scope of the field of the roentgenologist's activities in clinical team work. Shall the roentgenologist accept a fee from the physician referring a case or the patient only?

EVIDENCE OF APPRECIATION

In closing, I wish to express my appreciation for the splendid interest the members have shown for this program. It appears to me as an evidence of regard for those of us

who have labored so diligently in our efforts to provide something of interest for you at this time. It is my hope that another year will see our Country at peace and a large number of Roentgen men will be back to their original field of endeavor and will manifest more enthusiasm than ever for our Annual Meetings.

President B. H. Orndoff.

ENLARGEMENT OF THE HEART*

A. W. Crane, M. D.
Kalamazoo, Michigan

The heart is by nature singularly adapted to the roentgen method of examination. Its size, its position within the thorax, its form and the pulsations of each chamber are open to study by screen and plate. By no other clinical means can these factors be so accurately and completely determined.

But let us not be led to think that a diagnosis of a heart disease should be ventured by the x-ray alone. The diagnostician has still to consider the auscultatory phenomena and the arterial pressure against which the heart works. He may need to know the fluctuations of pressure within the right auricle and left ventricle as shown by polygraphic tracings or the variations of electrical potential, as shown by the electro-cardiograph. He must always consider the symptomatology, such as dyspnoea, and thoracic pain, as well as the physical signs of decompensation, such as oedema, serous effusions, enlargement of the liver, haemoptysis, cyanosis and various complications. And finally, in a larger clinical sense, he must decide if he is dealing with a nephritic heart, a hyperthyroid heart, a syphilitic heart, a rheumatic heart, or the heart of arteriosclerosis. It is only thus that he arrives at the end of all diagnostic endeavor—the determination of treatment and prognosis.

Having oriented ourselves within the field of clinical diagnosis we may see that the x-ray factors are yet of real and fundamental importance. Of these factors the most fundamental is heart volume. Clinicians pride themselves upon

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*Read before the Western Roentgen Society, November 20, 21, 22, 1918.

their ability to define heart borders. The average practitioner relies upon the position of the apex beat. But the roentgen ray has shown that the cardiac outline is approximated only by the most skillful examiner, and that the apex beat does not correspond to the true anatomic apex. The practical importance of heart size depends upon the accuracy of its determination and this factor is now raised to the first order of importance by the extraordinary work of Dr. Bardeen of the University of Wisconsin.

Most of you are doubtless already familiar with the Bardeen method of determining heart volume. His first paper with finished tables is to be found in the *American Journal of Roentgenology* for December, 1917. His larger paper with fuller details of his experiments is published in the *American Journal of Anatomy,* March, 1918. My personal experience with this method convinces me that it is the best method known and combines accuracy with simplicity and practicability.

The fruits of Bardeen's work are found in two tables which together give the relation of the normal heart silhouette-area of a given size to the approximate transverse diameter, body-weight, heart-weight, heart-volume in diastole and height for either sex from infancy to old age. These tables may not be considered indispensable in the x-ray diagnostics of the heart.

Briefly, the Bardeen method consists in a teleroentgenogram of the heart at two meters. The patient is placed in the sitting posture with the front of the chest against the plate, which is inclined to an angle of twenty degrees. The radial axis is through the tenth dorsal vertebra. The diastolic area is obtained by having a time exposure of at least one and one-half seconds in moderately full inspiration. From the plate thus obtained the heart shadow is traced upon a superimposed glass-plate or tracing paper, so as to complete the outline at the base and from the apex to the right auricle. The total area in square centimeters

is now estimated by the planimeter, and reduced six per cent. in order to obtain the true parallel-ray silhouette area.

This reduction of six per cent. was found to be a fair average to compensate for the divergence of the x-rays. The calculation, of course, requires the total distance from front to back of thorax and the distance of the median plane of the heart from the front. Knowing the distance of the anode of the tube from the plate, the per cent. of reduction is readily computed. The distance of the heart from the front of the chest was found by Bardeen from post-mortem studies and from stereoscopic determinates in the living.

The question arises whether or not any average figure is sufficiently accurate to cover the wide variation in the contour of the human thorax and the thickness of the chest wall, especially in the female. In this connection, I would mention a method of determining the size and depth of cavities within the chest, published by me in 1899,* which seems especially adapted to determining, as well, the depth of the heart within the chest and also the parallel-ray silhouette. This method could be reserved for cases showing a considerable departure from the average form.

The inherent factor of error in the Bardeen method is surprisingly small. The only weak parts of the process are the factor of reduction and the completion of the heart silhouette, which introduces the personal equation. The roentgenologist in this regard requires some training in recognizing the corresponding points between the x-ray outline and the anatomic structure. Bardeen has shown by his post-mortem studies that this can be done with reasonable accuracy. However, the factor of personal judgment can not be wholly eliminated, and we may say in general, that any diagnostic procedure is only as good as the judgment of the man who uses it.

The use of the planimeter for estimating the square area

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*Skiascopy of the Respiratory Organs, Phil. Med. Jour., March, 1899.

of the heart, is a clever adaptation to clinical purposes of an instrument well known to engineers. This remarkable invention computes automatically the square contents of any area, however irregular the outline. Without this instrument the Bardeen method would be impossible, because there is no mathematical construction or formula whereby an area such as a heart-silhouette could practicably be determined.

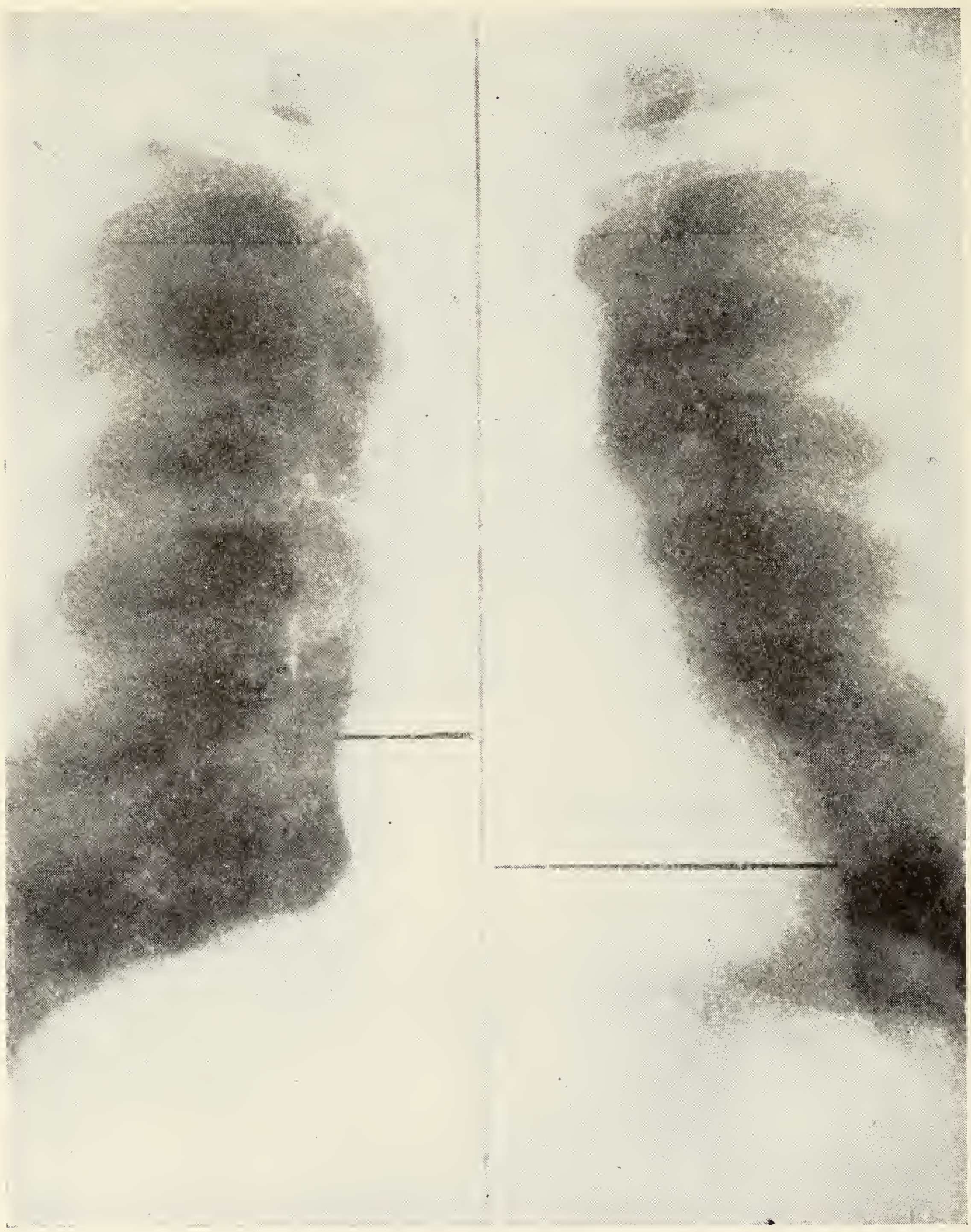
Bardeen selects the sitting posture, because the heart is thus subjected to the least physiologic variations of size. In the standing position the heart averages from five to ten per cent. smaller and in the prone position from five to seven per cent. larger. These changes in size are associated chiefly with variations in the hydrostatic pressure within the inferior vena cava. Moderately deep inspiration is used because the negative pressure within the thorax helps to ensure a good diastolic filling of the heart. A good size gas bubble within the stomach, from soda and tartaric acid, is advised to aid in defining the apex. A careful adherence to the technique used by Bardeen is necessary if his tables are to be utilized.

There are many cases where intrathoracic disease so obscures the cardiac outline that the silhouette can not satisfactorily be obtained. Pleuritic effusion, empyaemia, mediastinal growths, aneurism and tuberculosis are familiar examples. As a rule physical signs are equally obscured in these cases. However in such conditions, the estimate of heart volume is rarely of clinical importance.

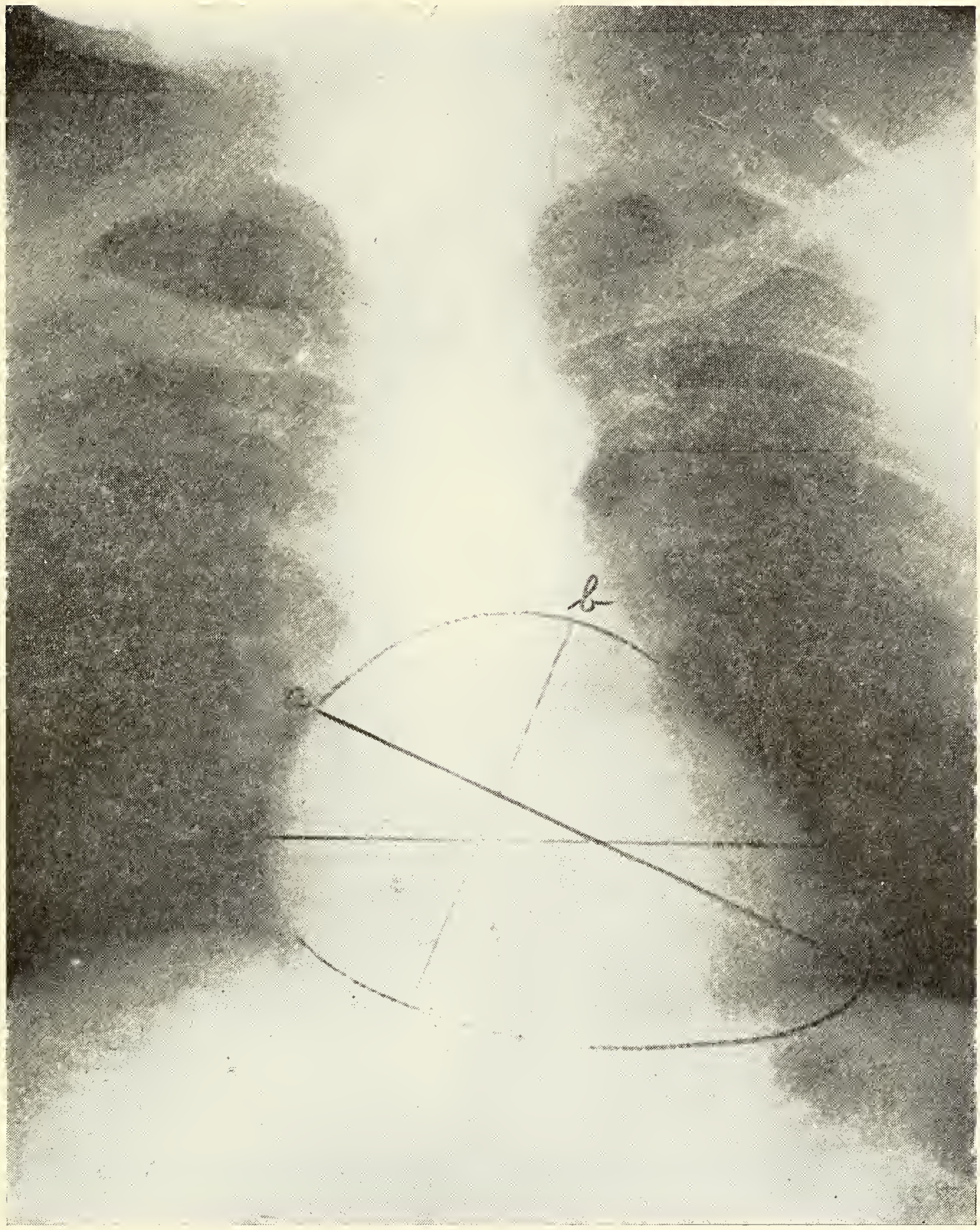
A method of precision in estimating heart volume suggests at once the question of the undersized heart. This is largely an uncultivated field, which now lies open to the roentgenologist. The small heart of tuberculosis, the dropped heart, and the heart after exhausting illness, are well known. But the undersized heart in its relations to development, disease, treatment and especially prognosis is but sparingly touched in medical literature.

The enlarged heart, on the contrary, has been exhaustively studied, and is of increasing interest in roentgenology. Physiologic enlargement is to be kept in mind. The athletic heart, the large heart found in certain industrial occupations, and the heart of the gourmand (such as the now extinct Munich beer heart) are to be distinguished from the hearts enlarged from valvular disease, congenital defects, adherent pericardium, myocarditis, chronic interstitial nephritis and arterial hypertension. Hypertrophy must be differentiated from dilatation, and dilatation from apparent enlargement of a pericardial effusion.

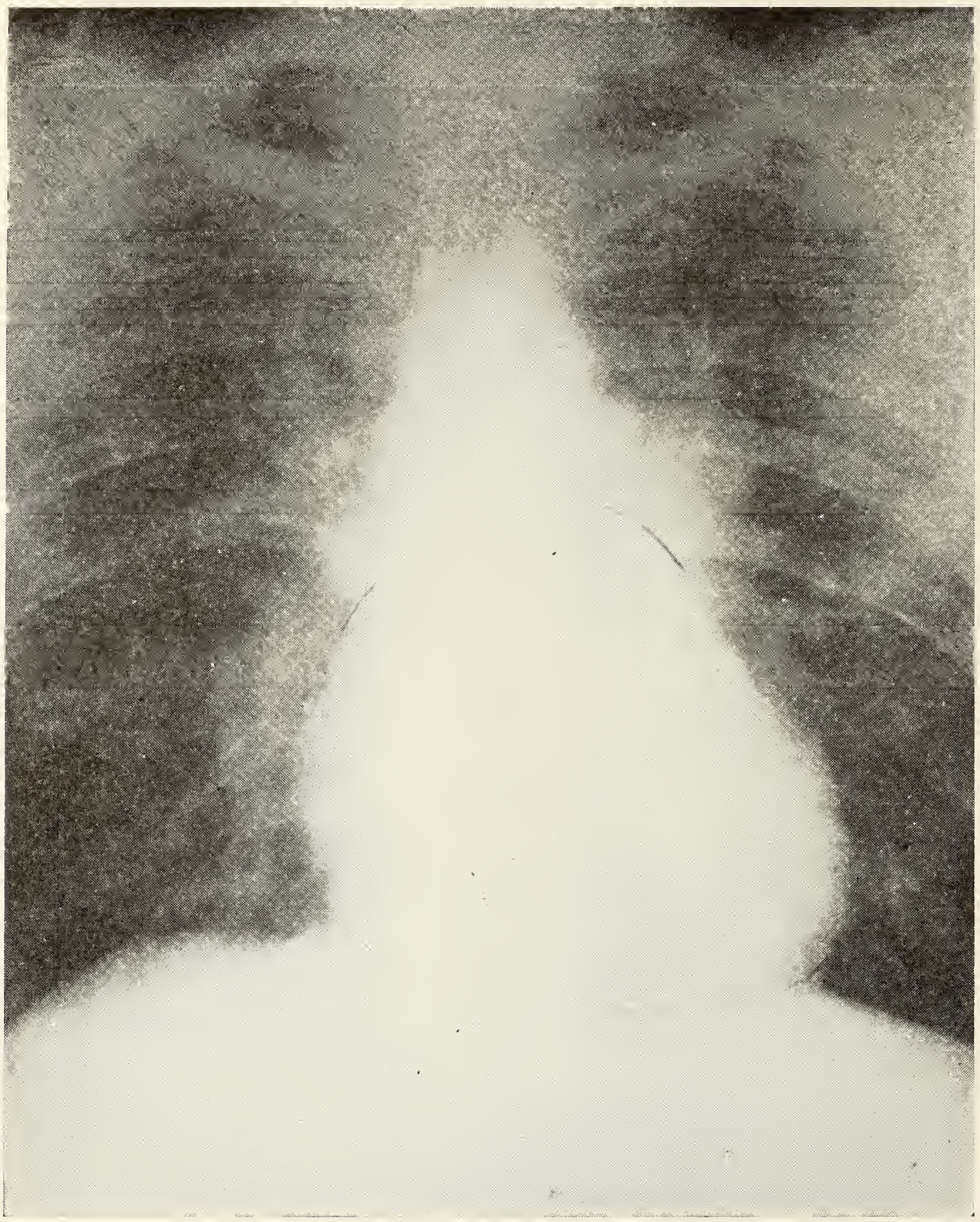
Such differentiations can not be made from x-ray data alone. As previously stated, a conjunction with clinical study is necessary. The requisite personal skill in this regard is no more or less difficult to the roentgenologist than is the differentiated diagnosis of gastro-intestinal lesions which are usually three-fourths clinical. The roentgenologist may if he chooses thus maintain his status as a medical man, where the x-ray technician and photographer can not follow.



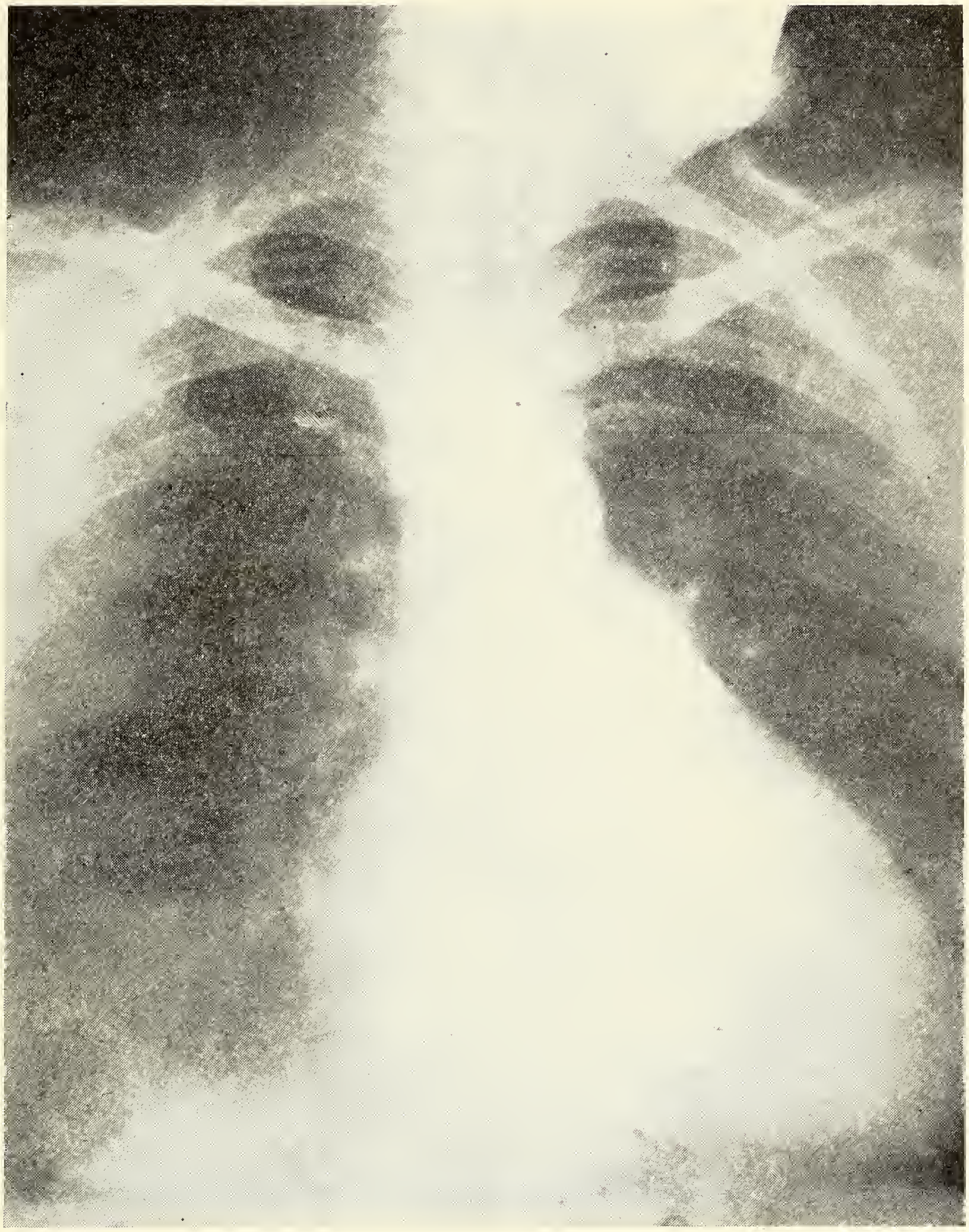
1a. Male. Normal heart. Showing method of measuring size of heart by greatest diameter to right and left of median line.



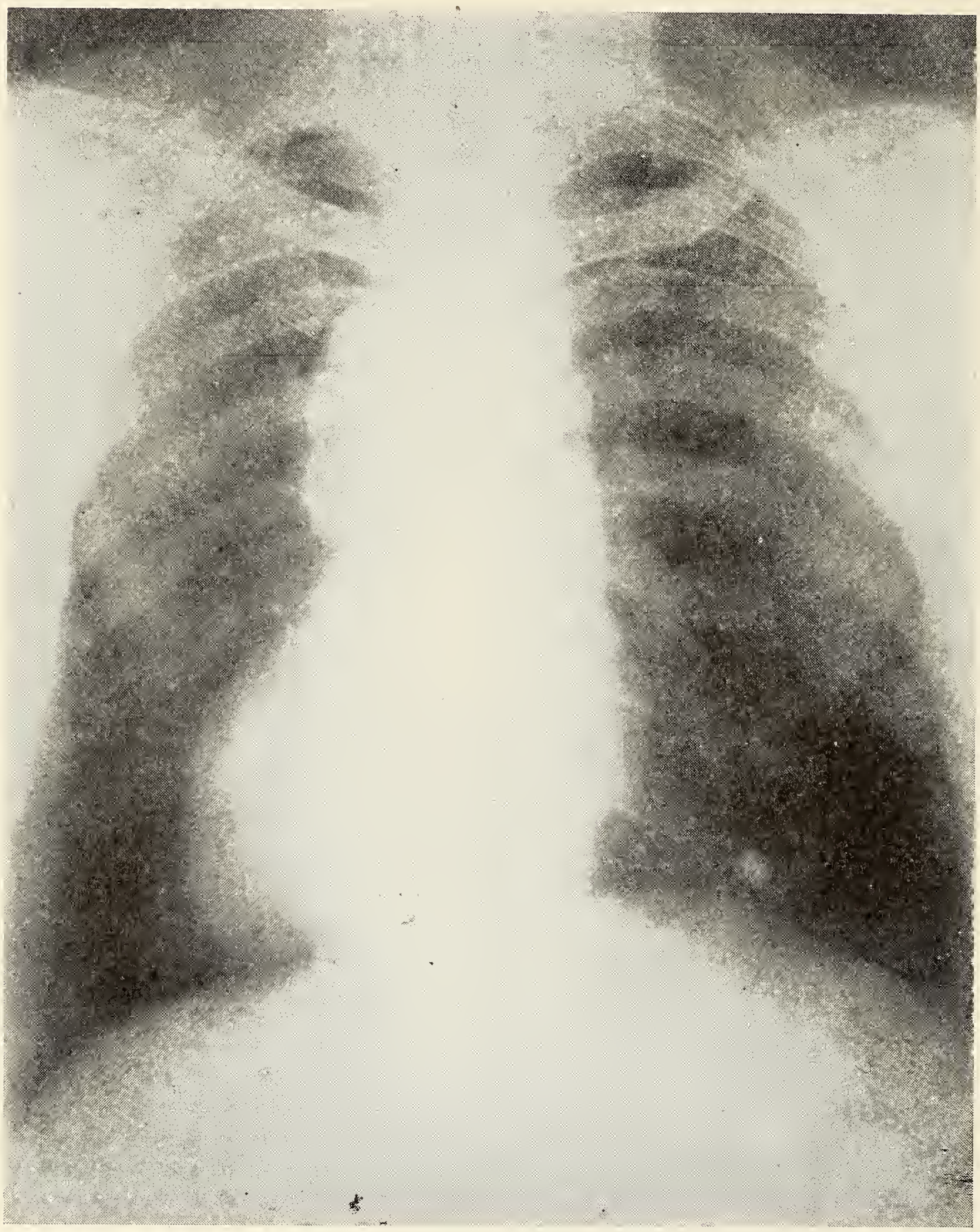
1b. Male. Angina pectoris. Cardiac hypertrophy. Showing method of measuring size of heart by (a) longitudinal diameter, (b) greatest transverse diameter, (c) greatest horizontal diameter.



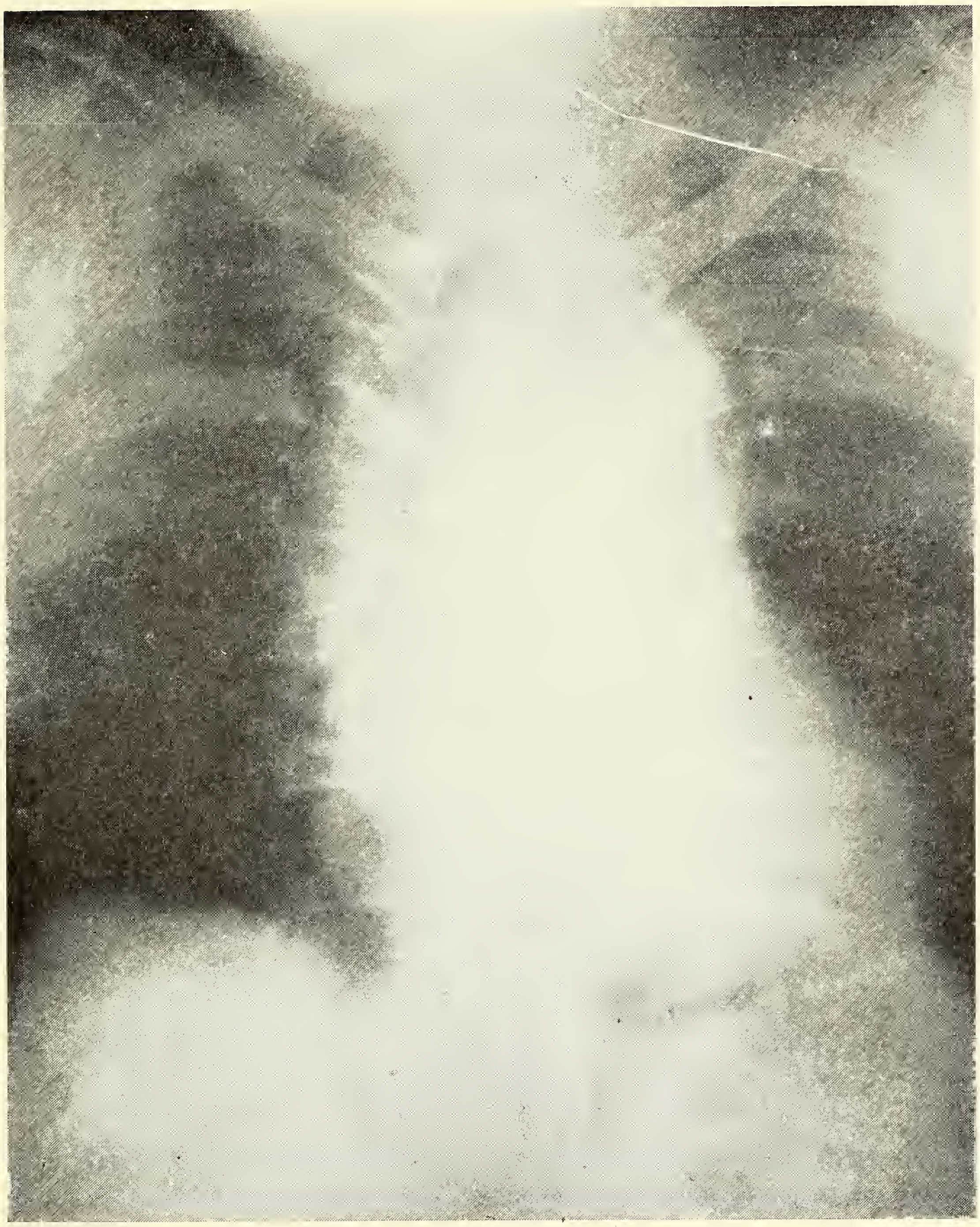
2. Male, age 35. Athletic heart of a long distance walker. Outlined to illustrate the Bardeen method.



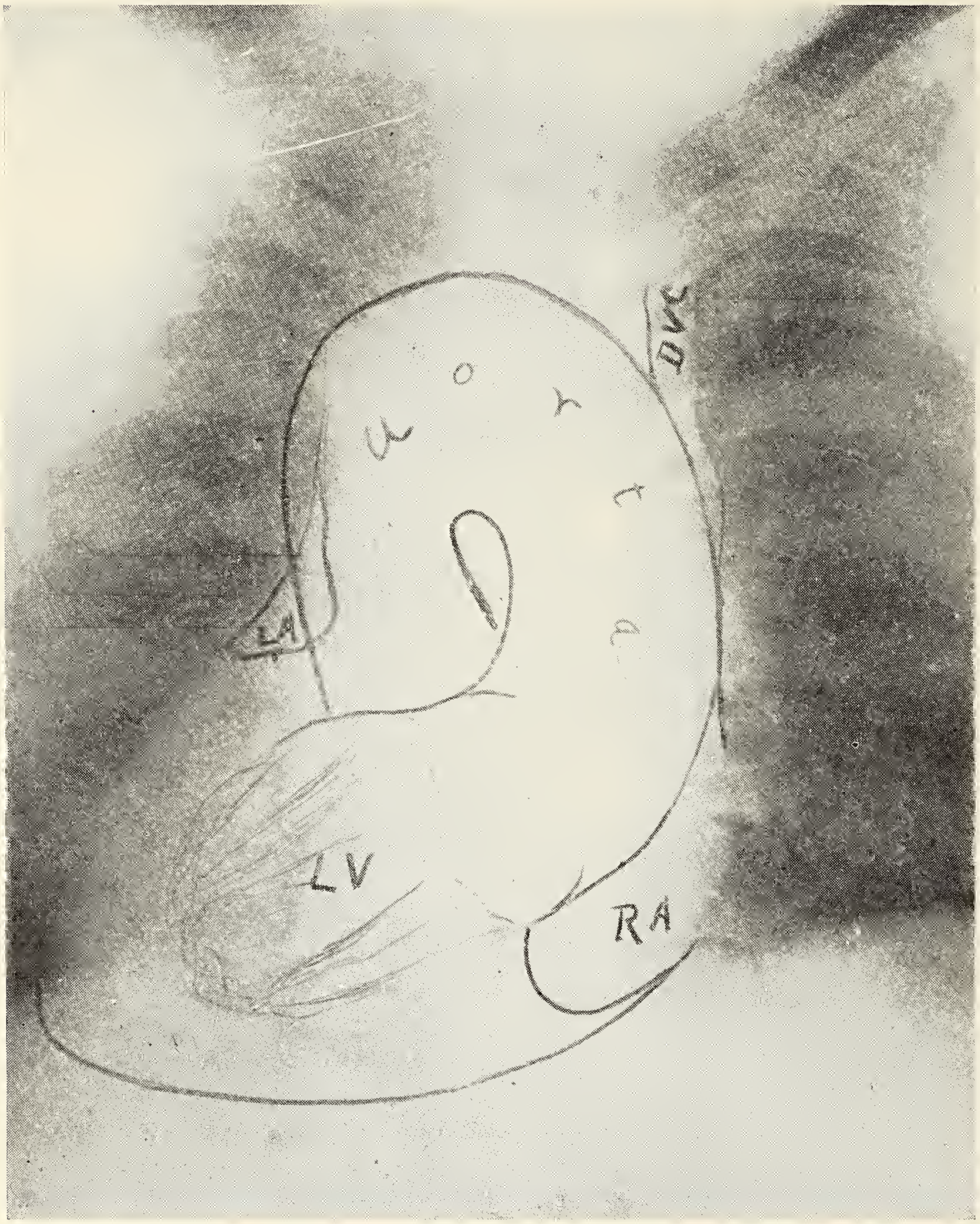
3. Female, age 40. No murmur. Myocarditis with enlargement. Observe passive congestion at base of both lungs.



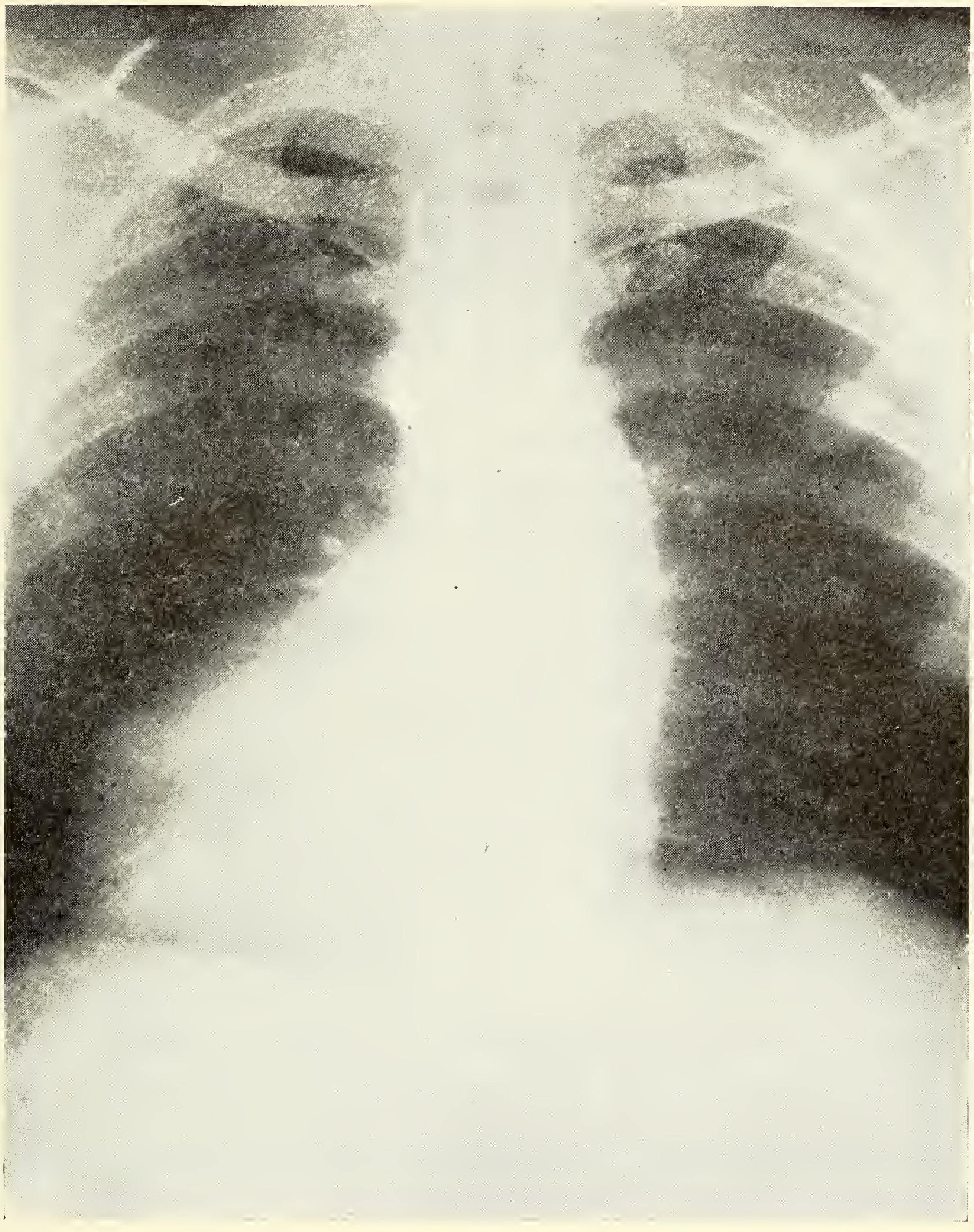
4. Male. Age 57. Diastolic murmur over sternum, and a short systolic murmur at apex. Aortic regurgitation. Pulse 84, regular. Blood pressure S 260 / D 130. Wasserman negative. Albumin and casts in urine. A nephritic heart of hypertension with hypertrophy and dilatation of the aorta.



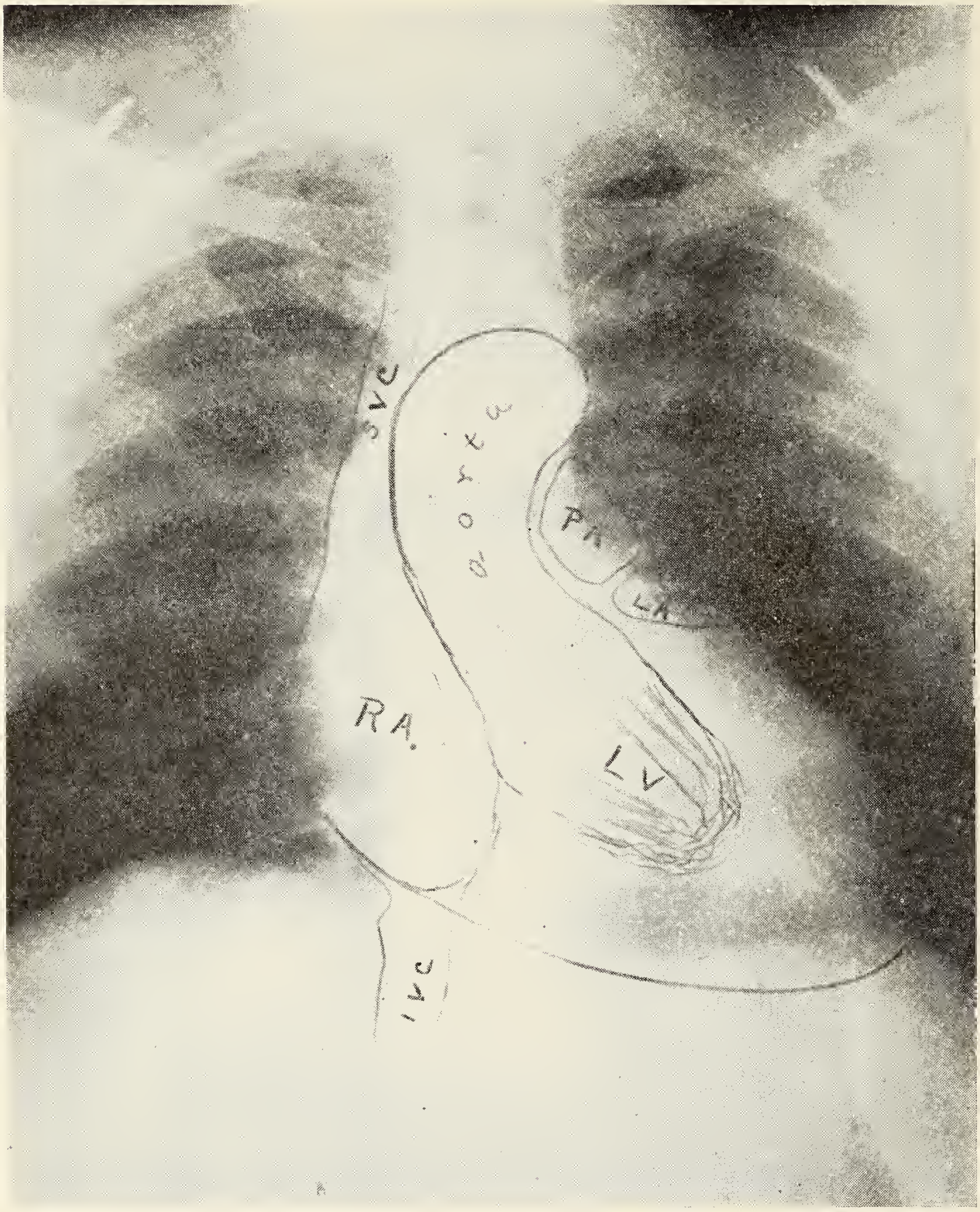
5a. Male. Age 47. Presystolic and systolic murmur at apex with a heavy bruit over aortic interspace. Aortic stenosis with aortitis. Pulse 76, regular. Blood pressure S 120 / D 45. Wasserman negative but patient recovered under vigorous antisyphilitic treatment. A syphilitic heart with hypertropy and dilatations of the aorta.



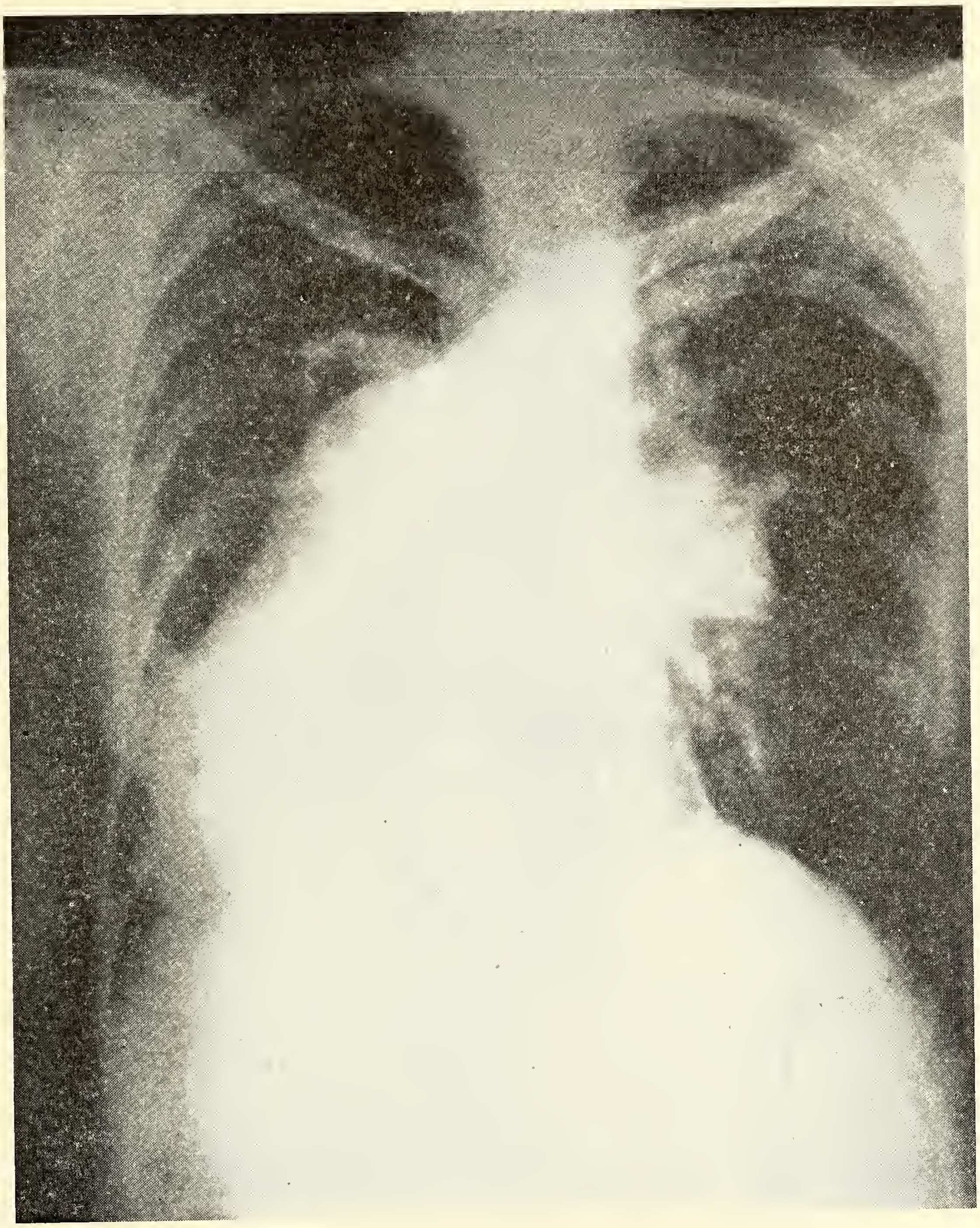
5b. Same as 5a but with chambers outlined after frozen sections as illustrated in Norris and Landis (Diseases of the Chest).



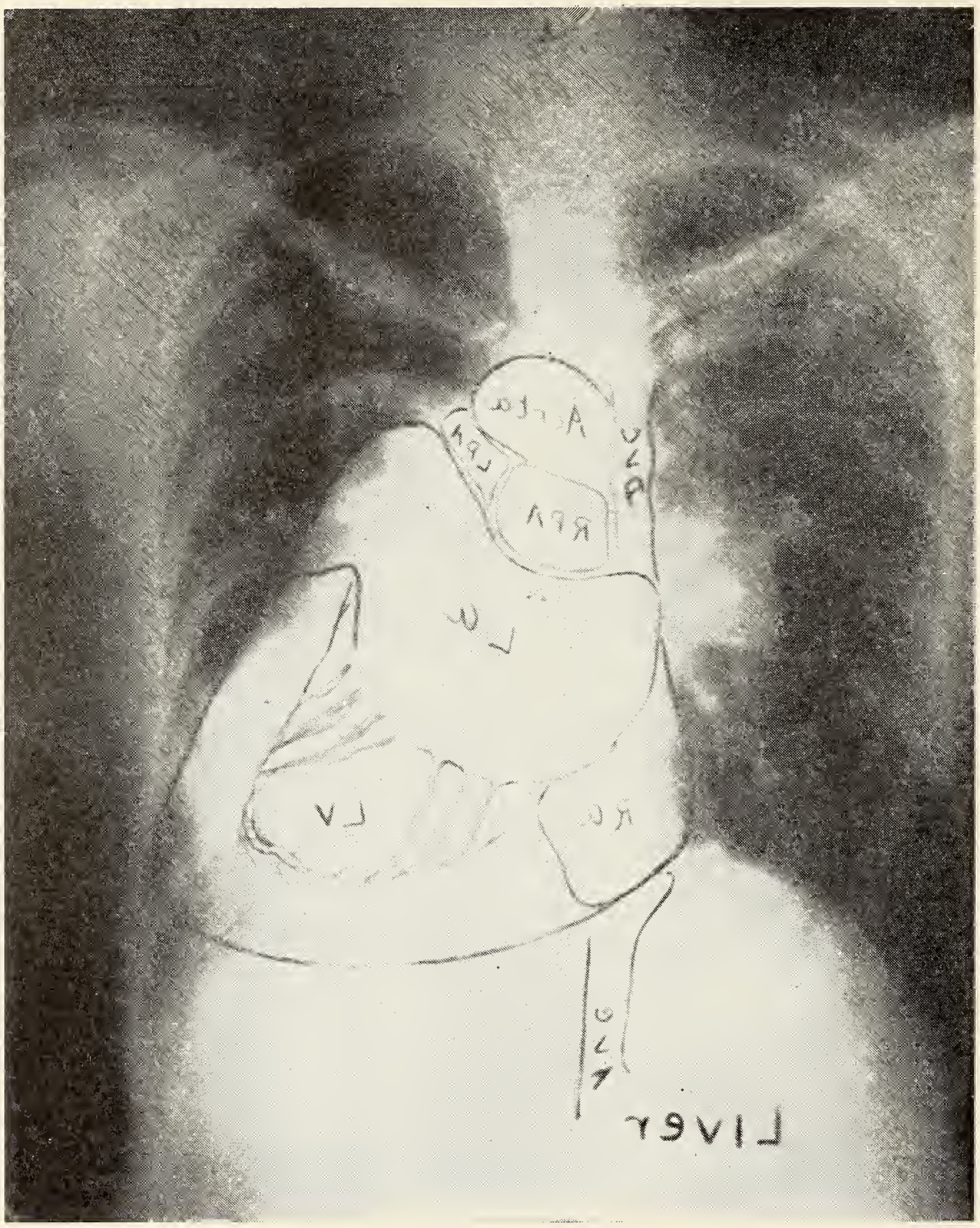
6a. Male. Age 48. Large soft diastolic murmur over sternum and a presystolic rumble (Flint's murmur) without thrill. Aortic regurgitation, Pulse 80, regular, Corrigan. Blood pressure S 180 / D 0 with change of note at 70. Negative Wasserman. History of tonsilitis and acute rheumatism.



6b. Same as 6a but with chambers outlined after frozen sections as illustrated in Norris and Landis (Diseases of the Chest).



7a. Female. Age 58. Systolic and presystolic murmur at apex. Thrill present. Mitral stenosis. Pulse 70, regular. Blood pressure S 150 / D 95. Wasserman negative.



7b. Same as 7a but with chambers outlined after frozen sections as illustrated in Norris and Landis (Diseases of the Chest).

Discussion

Dr. Hollis E. Potter, Chicago: *Mr. Chairman, Gentlemen and Ladies:* I am particularly glad to be able to see and hear a man of Dr. Crane's clinical experience in heart lesions present this new method for use in cardiac diagnosis worked out with such care by Dr. Bardeen. Most of you know that Dr. Crane's daily occupation is that of a medical consultant, who used the ray methods in his work so early and has continued to use them so faithfully that he qualifies in any group of either roentgenologists or clinicians. Such coördination of purposes makes him a particularly competent authority as to the value of any new x-ray method of heart diagnosis.

Heretofore we have been satisfied to trace out cardiac outlines and judge from averages whether there was any total enlargement present or any increase in the size of individual chambers. The method at hand gives us in addition an accurate area measurement of cardiac shadow. Dr. Bardeen has shown that this area bears a constant relation to its volume so therefore a ratio of heart volume to body weight and height is easily determined. It seems very rational to me that this ratio is the most important factor that mensuration by x-rays can produce. The use of this method does not prevent the observation of enlargement of individual heart chambers, aortic changes, etc., which we have previously done with no little value.

420 South Rose Street

FILLING DEFECTS OF THE ALIMENTARY TRACT DUE TO EXTRA-ALIMENTARY CAUSES*

Maximilian John Hubeny, M. D.
Chicago

The subject matter embodied in this paper may be essentially of an academic nature, since it attempts to propound accepted facts recognized by most roentgenologists who are at all familiar with gastro-intestinal roentgenological examinations. To these it is the hope of the writer that a citation of a few unusual and interesting cases will compensate for the tediousness of their efforts in perusing this discourse. It is possible, however, that a collective resume will impress one with the necessity of recognizing allied phenomena, which might be exceedingly misleading unless the causative factor be appreciated.

In the phylogenetic development of the gut tube, there has come about a radical subdivision in morphology, physiology and function; these subdivisions are intimately related and an affection of one tends to disorganize all.

The gall-bladder, the liver, the pancreas and the stomach are embryologically, anatomically, physiologically and pathologically closely related and should be considered as one physiological system, and because of the continuity and contiguity of these numerous structures it is quite necessary to recognize filling defects of pathologic and non-pathologic significance.

The filling defect is the basic roentgenologic sign of morbidity and because of simulants, great care should be exercised in their proper recognition.

The direct incentive responsible for this attempt at clarification was the presentation of plates for interpretation,

*Read before the Western Roentgen Society, November 20, 21, 22, 1918.

this examination having been made elsewhere. The original roentgenologic diagnosis was gastric new growth which, to the experienced roentgenologist was immediately perceived as erroneous, for it was the usual and customary filling defect produced by the pressure of the spine on the gastric shadow.

Unfortunately the patient had already been operated on, at which time the stomach apparently was quite normal, but it left the surgeon in a prejudiced state of mind with reference to the value of x-ray examinations.

It is therefore the object of this paper to prevent, if posrible, a reënactment of such experiences.

The rights of the patient must be considered in rendering a diagnosis, which should be conservative, for after all the diagnosis, many times, consists of an admixture of facts and opinions, the latter being more or less valuable, depending on the logic, aptitude, and experience of the observer.

Irregularities in outline are the real essence of roentgenological observations, these irregularities may be due to additions to or subtractions from the normal contour. Filling defects are therefore subtractions, and these may be (A) first, organic; second, spasmodic; third, physiologic; (B) intra-alimentary or extra-alimentary.

Errors in technique are responsible for some apparent defects. Among the most frequent is the neglect of eliminating pressure of the spine on the gastric shadow because of failure to elevate the chest and hips of the patient.

Assuming that proper technique is practiced, this source of mistakes can readily be excluded.

The genuineness of a filling-defect is portrayed by its persistence under all conditions during fluoroscopic examination, its unaltered position and contour after massage, its constance upon all plates and successive examinations, and the lack of obliteration after the administration of antispasmodics. The permanence and actuality of a filling-

defect can not always be determined by taking a few roentgenograms alone. Occasionally many plates are necessary. The fluoroscopic examination is often invaluable, for the shadow can be observed at various angles and positions, with the application of manipulation and pressure, and, sometimes, the effect of gravity renders an obscure point quite perceptible.

Sometimes absence of peristalsis will assist in differentiation. The filling-defect may correspond to a palpable mass, for in occasional instances tumor masses that elude detection at the physical examination are sometimes felt by the roentgenologist. Unevenness of outline and lack of symmetry are rather constant in true filling-defects. Abdominal rigidity and tension, pressure of a deformed costal arch, ascites, ovarian cyst, or pregnancy, may produce irregularities in the outline of the alimentary canal.

Faulty media in which the barium is not evenly distributed may be misleading. Gas in the colon or fecal matter in the adjacent bowel also may cause indentations; however, palpatory shifting will help to identify these. Abnormal ligaments, peritoneal adhesions or membranes may produce filling-defects. Mention will first be made of nonpathologic filling-defects.

Commencing at the oral opening the first defect noticeable may be the esophageal indentation produced by the aortic arch, which is liable to be accentuated by the presence of aneurysm. The next irregularity is produced by the anatomic relation of the esophageal opening in the fornix of the stomach; this is accentuated or moderated by the angle of entrance. Sometimes the diaphragm produces an irregularity which is caused by the apposition of the cardia and the muscular interdigitations of the diaphragm. This has been noted especially in cases where tight corset lacing has been practiced.

The spleen is the next offender, the shadow produced being quite characteristic. The size and shape of this inden-

tation will vary according to the size and shape of the spleen, the type of stomach, etc., along the greater curvature and in close approximation to the splenic defect we often have a gastric irregularity due to a gas distended or fecal filled splenic flexure. Sometimes the lesser curvature presents a conformation, due to large psoas muscles, and the usual exhibition associated with the abdominal aorta. Confirmatory diagnosis of aneurysm of the abdominal aorta can occasionally be made because undue gastric pulsation can be detected fluoroscopically. A physiologic kyphotic or lordotic spine may produce simulants of defects. The gastric shadow is sometimes affected by the pressure of the transverse colon, or a filled hepatic flexure, which may impinge on the pyloric region.

In some instances the gall bladder either pathologic or non-pathologic, but especially the former, may subtract from the area of the pyloric region, particularly along the greater curvature. The third portion of the duodenum may show irregularities, as it passes over the spine. It often happens that a concentric arrangement of portions of the jejunum or ileum, especially the latter, will cause apparent filling defects of the adjacent bowels, especially misleading when a non-visualized mass is contained in the lumen of the intestines.

The terminal loops of the ileum are many times lifted above the ileo-pectineal lines by a filled cecum, sigmoid and rectum or a distended bladder.

The ileo-pectineal eminence often leaves its impress on the cecum or ascending colon as well as distorting the region of the junction of the iliac and pelvic colons.

It is quite impossible to embrace all or most of the phenomena in this brief, but the aforementioned conditions typify the usual probable sources of confusion, which can readily be recognized if anticipated.

Among some of the pathologic conditions which produce filling defects are carcinoma, lympho-sarcoma, spleno-

myelogenous leukemia, splenic leukemia, syphilis, varicosities, adhesions, benign tumors, such as uterine fibroids and ovarian cysts.

Unusual combinations sometimes exist, the writer being fortunate in obtaining an instance of a joint lesion of an aneurysm of the arch of the aorta and carcinoma of the esophagus at its lower opening, in which dysphagia and dyspnoea were marked with an associated arrythmia, the latter two symptoms were always accentuated after eating. The fluoroscopic and plate examinations distinctly showed the aortic impress on the esophageal contents which would explain in a mechanical way the reason for the aggravation of symptoms after eating.

Sometimes the plate examination clinches a problematical case. An instance occurred in which a marked and persistent pyloric filling defect existed. The appearance was atypical for gastric new growth, and because the gastric analysis and clinical history appeared negative, a definite diagnosis was not made until a plate taken of the gall bladder region, with the opaque meal still in the stomach, disclosed a large gall stone situated a short distance from the pylorus and concentrically located with the arc of the filling defect. Operation revealed a distended gall bladder with one large stone.

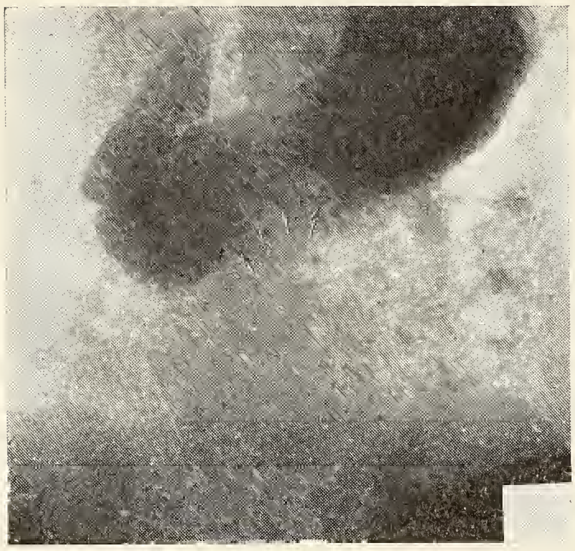
A somewhat similar defect was present in a case having several of the usual clinical signs of gastric carcinoma, especially predominant was the cachexia. Plates of the gall bladder region were negative. Fluoroscopic examination was unsuccessful in separating the defect from the gastric outline, which was atypical for new growth. A diagnosis of malignancy was made. Laparotomy revealed a cyst in the omphalo-mesenteric duct which was adherent to the gastric wall.

The following two cases represent similar roentgenological aspects, although differing in their etiology. Roentgenologically, the ileum and cecum were situated in the

abdomen, the former as exhibited six hours post cibum was arranged in a semicircular manner, the convexity pointing cephalicward. It was surmised that because of its conformation the cause of pressure was due to hydrostatic forces. The thought immediately centered on the bladder. In one case catheterization was followed by the complete disappearance of a tumor mass which was quite palpable through the abdomen. Thirty-nine ounces of residual urine were obtained. Chemically this urine showed no decomposition.

It was known that a large prostate was present, but the supposed abdominal tumor (distended bladder) was the perplexing problem for diagnosis. Removal of the prostate gave complete relief.

The other case presented great difficulty in catheterization—only a few drops of urine passing at a time, no satisfactory catheterization was possible. Operation revealed a mucous flap near the urethral orifice in the bladder which acted as a valve, interfering with urinary evacuation.

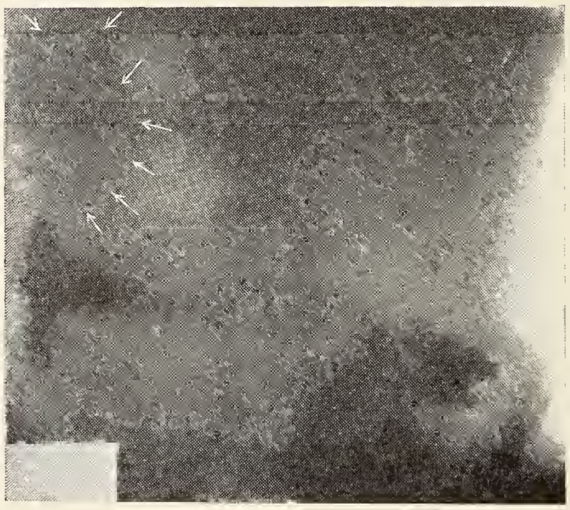


No. 1
Pressure of Spine on Gastric Shadow Producing Characteristic Filling Defect.

No. 2

Filling Defects Due to Diaphragm and Esophageal Inlet.

No. 3
Filling Defect Due to Entrance of Esophagus into Cardia. Splenic Defect.

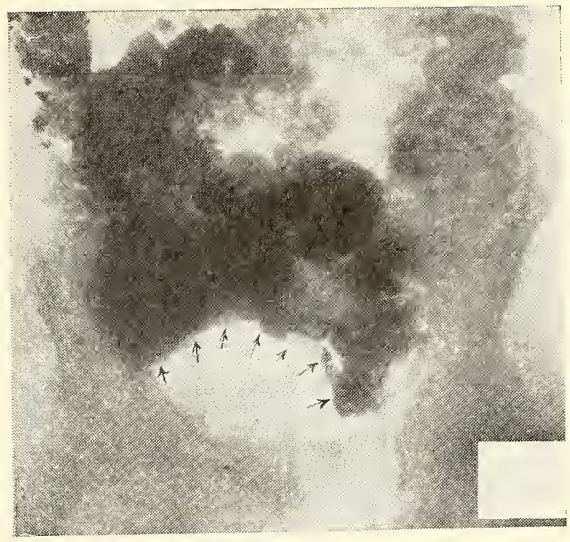


No. 4

Splenic Indentation on Gas Filled Stomach.

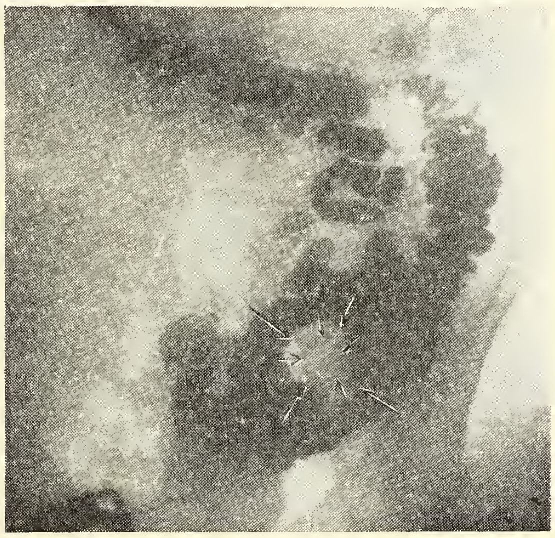
No. 5

Gas Filled Colon Pressing on Gastric Outline with Rugae Quite Prominent. If the Usual Food Matter Were Present, a Diagnostic Error Would be Possible.



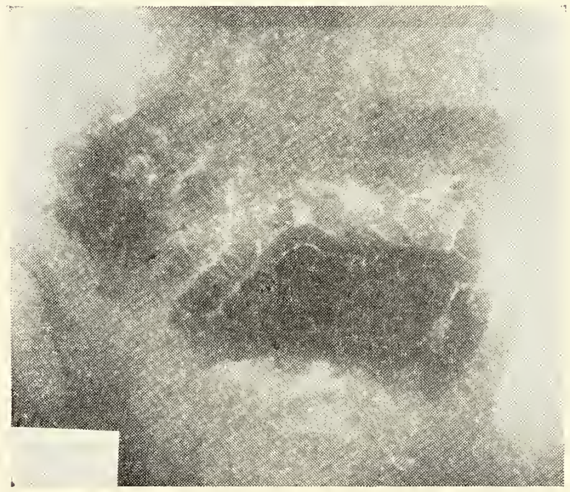
No. 6

Semi-Circular Conformation of Ileum and Cecum Due to Filled Rectum.



No. 7

Concentric Arrangement of Small Bowel Showing the Reason for Filling Defect.



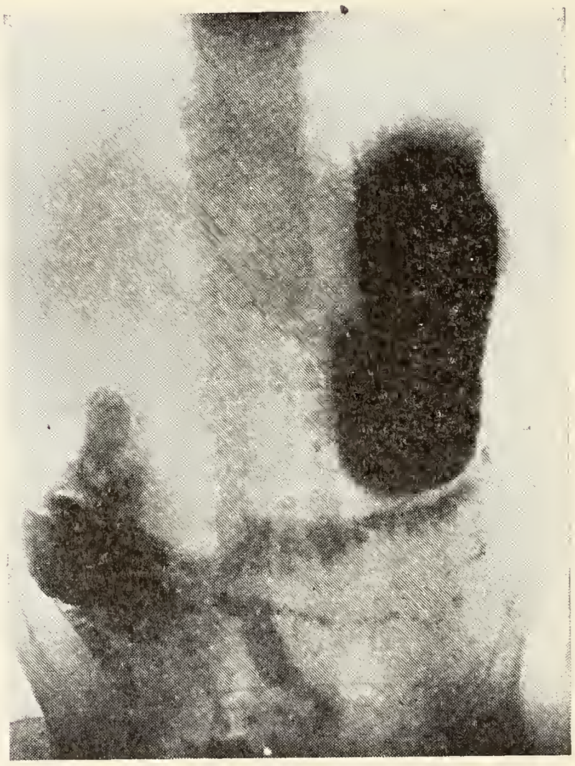
No. 8

Shows Approximation of Contiguous and Continuous Portions of the Small Bowel.

No. 9
Filling Defect Produced by Carcinomatous Thyroid with a Consequent Obstruction Diveticulum.

No. 11
Displacement of Stomach Due to Lympho-Sarcoma.

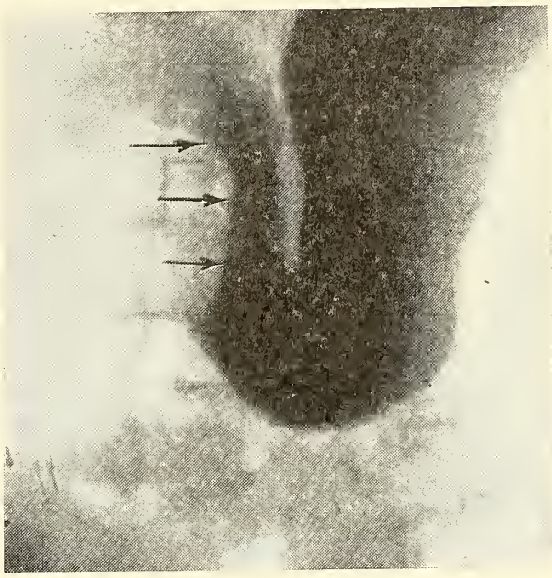
No. 10
Defect Due to Aortic Pressure on Esophagus.



No. 12
Displaced Stomach Because of Lympho-Sarcoma.

No. 13

Filling Defect Due to Large Gall Bladder.



No. 14

Cyst of Allantois.

No. 15

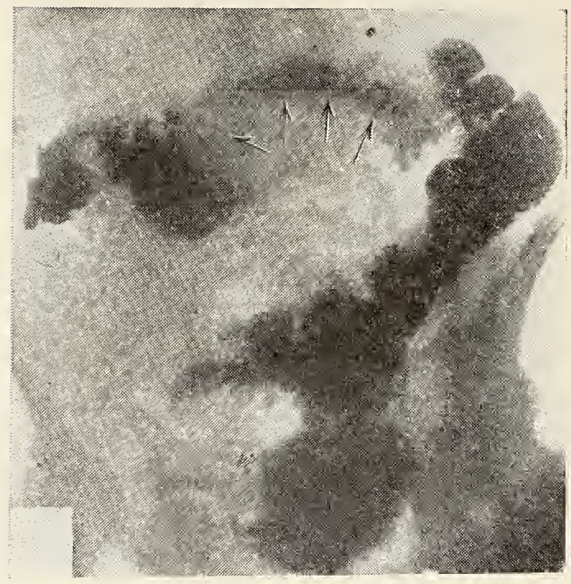
Displaced Stomach Because of Large Spleen.

No. 16

Defect Due to Carcinoma of Head of Pancreas.

No. 17

Defect Due to Lympho-Sarcoma. Same Case as Illustrated by Plates No. 18 and No. 19.



No. 19

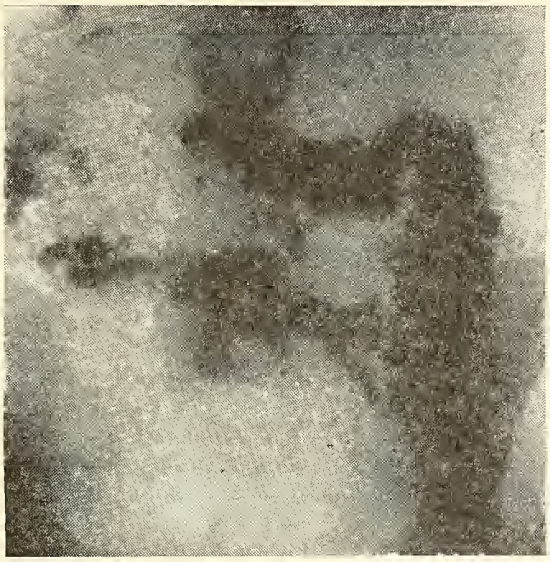
Filling Defect of Transverse Colon Due to Lympho-Sarcoma.

No. 18

Filling Defect Due to Lympho-Sarcoma.

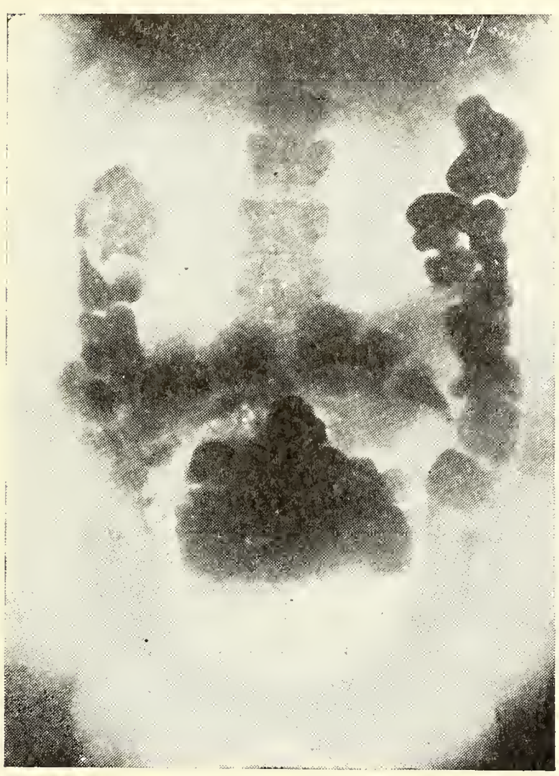
No. 20

Displacement of Small Bowel, Due to Large Ovarian Cyst.



No. 21
Ileum, Cecum and Appendix Lifted Out of True Pelvis Because of Fluid in Peritoneal Cavity.

No. 22
Filling Defect of Iliac Colon Because of Lympho-Sarcoma.



No. 23
Displacement of Transverse Colon Upwards, Because of Distended Rectum and Sigmoid.

No. 24
High Position of Small Bowel Due to Marked Residual Urine in Bladder.

ESSENTIAL PRINCIPLES OF DEEP ROENTGENOTHERAPY*

Albert F. Tyler, B. Sc., M. D.
Omaha

It would be difficult for anyone to present anything very new on the subject of roentgenotherapy after the pioneer work which has been done by such men as Pusey, Caldwell, Pfahler, Case, Holding and Clarke. It is my purpose, however, to review briefly the field of deep roentgenotherapy and to mention the factors which are essential to success.

Roentgenotherapy has passed through the experimental stage and has been in use for a considerable period of time with very satisfactory results. During the early period of employment of this therapeutic means, the profession was handicapped by the physical limitations of the apparatus used for producing the roentgen rays. Ouly a few years ago these physical handicaps were brushed aside and since that time a new chapter has been written in roentgenotherapy. These physical handicaps were brushed aside by the genius of some of America's foremost physicists. We have in mind the invention of the so-called interrupterless transformer devised by Clyde Snook of Philadelphia, and the invention of the tube which makes present day roentgenotherapy possible, by Prof. W. D. Coolidge. These two American inventions have made possible a forward step in roentgenotherapy which has surpassed the fondest expectations of the pioneers in this line of work. In fact, no less an authority than Boggs of Pittsburg makes the assertion in a recent article, "That it is now possible to give by means of the Coolidge tube, the same dosage at a depth of ten centimeters, as would be given by ninety-two grams of radium at the same distance".[19]

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*Read before Joint Meeting of Chicago Medical and Western Roentgen Societies, November 21, 1918.

Now that we have perfected the apparatus for doing satisfactory deep therapy, the field for employment of this therapeutic agent has become quite clearly marked out. It is my opinion as well as that of others, that the roentgen ray should never supplant surgical treatment, but should be supplemental to it. The types of cases which are suitable for this treatment are well known, but we will mention them in detail so that we will have clearly before us the field which is suitable for this method of treatment. We can best divide these into the infections, the hyperplasias, diseases of the blood and vessels and the malignant growths.

Of the infections, Lupus Vulgaris, Lupus Erythematosus, Actinomycosis, Ringworm and Tuberculous Glands can be greatly benefited by the use of roentgenotherapy.

Lupus Vulgaris is not so common in America as it is in Europe where Finsen has employed with great benefit the use of the ultra violet ray passed through quartz to the site of the disease. It is my opinion that the roentgen ray will accomplish all that the ultra violet ray will accomplish and will do it with greater ease, less inconvenience to the patient and with more satisfactory results. It is my custom to treat these patients once a week with a 9¾ inch spark gap, six millimeters aluminum and sole leather filter, five milleamperes of current for five minutes at an anode skin distance of eight inches. This is equivalent to an erythema dose measured by the pastille and compared with Hampson's radiometer. By using this technique I do not have to check up the dosage at every treatment, simply checking occasionally to see whether the dosage is remaining constant. Usually three to five such treatments will clear up the average case of Lupus Vulgaris.

Lupus Erythematosus is more stubborn and requires heavier treatment even to the point of slight vesication. If the treatment is carried far enough the disease readily responds.

Actinomycosis: It has only been in recent years that this

disease has been treated with roentgenotherapy. In fact, in 1915 Brunzel[3] reported a case of Actinomycosis successfully treated by this method and made the statement that he was able to find only eight cases recorded in German literature, which had been treated in this manner. Since that time, we are sure that the treatment has been more generally employed, although we do not find much of it in recent literature. My personal experience in treating this disease has been very gratifying, as the cases have responded quite readily. Of course in the advanced cases where the tissues have softened down in local areas, these areas have been treated surgically to allow the escape of the liquid detritus. The same technique is employed in treating this condition that has been mentioned in the treatment of Lupus Vulgaris. In advanced cases the time elapsing from the beginning of treatment until the case has entirely recovered is considerably longer, occupying in many instances several months. Of course, medical treatment is used in conjunction with the roentgen ray.

Ringworm: The roentgen treatment of this condition is of comparatively recent origin, but has met with considerable favor with the profession. When one sees the certainty with which this can be treated and the ease with which the treatment can be administered, one cannot refuse to endorse the method. In my hands the technique employed is to give a single measured dose which produces epilation. As soon as epilation has been produced, the ringworm heals and in about three months the hair returns. There is no need to carry the treatment to the point of vesication and scarcely an erythema is necessary.

Tuberculous Glands: So universally satisfactory have been the results obtained by roentgenotherapy in tuberculous glands that many cases could be cited in the literature where this method is recorded in preference to surgical means. Especially in children where the cases are seen early and the glands are small, a few treatments will elim-

inate the condition entirely. Where the cases have been neglected and the glands have become large, the period of time necessary for recovery will be much longer and the glands will often break down and have to be incised in order to eliminate the detritus. No less an authority than S. L. Wang of New York has reported one thousand cases of tuberculosis of the cervical lymph glands. Pulmonary tuberculosis was a sequel in none. The technique employed in treating this condition is the use of highly filtered rays carried to the point of erythema, followed by a period of rest and then repeated as often as necessary, until the child has fully recovered.

Among the hyperplasias may be mentioned keloid, hyperthyroidism and uterine fibroid.

When proper technique is used in the treating of keloid, it is surprising how rapidly the sensitiveness disappears and how quickly the growth melts away. One need not carry the treatment to the point of erythema but should repeat an erythema dose as measured by the pastille about once in three weeks until the skin has become soft and pliable.

Hyperthyroidism: Roentgen treatment of this disease has been employed since the advent of the roentgen rays. In the earlier years the results were very disappointing, resulting in very little if any improvement in the majority of cases and leaving marked scarring of the neck in the region treated. Since the advent of more powerful apparatus so that heavier filters can be employed, the results have been much more satisfactory. In fact, in chosen cases the results have been 100%. There is no operative mortality and no nervous shock connected with the treatment. It is my belief that the treatment should be administered in very intensive doses at a single sitting, giving at least three times the pastille erythema dose, covering both lobes of the thyroid and also the thymus region. At the same time roentgenotherapy is instituted, the patient should be put to bed and medical treatment followed for the next

three weeks. Almost immediately under this regime the patient's pulse will drop, the toxic symptoms begin to disappear, and marked improvement will be noted. At the end of the three weeks' period the same dosage of roentgen ray is again given. Usually two or three such treatments at intervals of three to four weeks will be sufficient. In cases which do not respond to the first treatment, surgery should be recommended immediately so that the patient will not suffer too long for want of relief. In advanced cases where the heart is in such condition that surgery is not advisable, roentgenotherapy combined with medical treatment will very often improve the patient so that surgical treatment becomes possible.

Uterine Fibroids: The treatment of uterine fibroid by means of the roentgen ray was early advised and fostered by Kroenig and Gauss. At the time that they instituted this method of treatment the apparatus employed made it impossible to give the dosage which can be given today, and made the treatment so prolonged that the patient became exhausted before the treatment was finished. In spite of these handicaps very excellent results were reported and these results are daily being repeated by many American therapists with the greatest of ease. The technique employed should be the use of the heaviest filtration and the maximum dosage applied over the region of the fibroid through multiple points of entry. These ports of entry are marked off in squares on the abdominal wall, the ray being focused on the growth at all times. A corresponding surface on the back of the patient is marked off into squares and dosage applied in the same manner. It is my custom to give three times the pastille dose through each portal of entry at one sitting. To make it easier for the patient we usually give an erythema dose each day for three successive days, then allow the patient to rest three weeks. In practically all cases the hemorrhage will be markedly diminished before the second treatment is given, in many cases it will

entirely cease, in others it will not cease until after the second series of treatments. Usually three series of treatments are all that are necessary. I think it advisable to rule out carcinoma by currettement and microscopical examination of the scrapings. Where possible radium should be applied directly into the uterine cavity, in conjunction with roentgenotherapy through the abdominal wall and back. The results reported by Howard A. Kelly[10] recently show what can be accomplished by the use of radium in treating this condition. It is my experience that these same results can be obtained by the proper use of the roentgen ray.

Among the diseases of the blood and vessels may be mentioned Hodgkin's Disease, Angiomata, and Spleno-medullary Leukemia.

Hodgkin's Disease has presented a problem to the medical profession which has been largely unsolved. In recent years the employment of massive doses of highly penetrating roentgen rays has given very satisfactory results. In many cases the effect has been almost unbelievable. Case reported before this society about two years ago, a number of patients with marked enlargement of the cervical and axillary glands and such extensive involvement of the mediastinal glands that respiration was embarrassed. Massive treatment of these cases resulted in very marked diminution in the size of the glands and the return of these patients to a practically normal condition. Arthur F. Holding recently reported ninety-six cases of this disease with marked improvement in all of the patients, some of them remaining symptomatically well for a period as long as four to six years. All cases of this disease have a tendency to spring up into an active stage after a certain period of time, but if the patient will follow the treatment carefully, the disease can be repressed a second or even a third time. The younger the patient the more grave the prognosis. Eventually, however, a large percentage of the cases reach a stage where they fail to respond to any form of treatment,

but by proper use of the roentgen ray and taking the patients early in the disease, life can be prolonged for a period of from four to six years, they can be made much more comfortable and in some cases actual cures will result, extending over several years of time. If this can be accomplished by proper use of the roentgen ray, we feel that it is highly gratifying.

When Angiomata are exposed to the roentgen rays the endothelial lining of the arteries becomes very much swollen, producing an obliteration of the small arterioles, resulting in diminution in the size of the growth and eventual disappearance. The treatment is painless, harmless and where properly applied very satisfactory.

The treatment of Spleno-medullary Leukemia should be used in conjunction with the medical treatment and should be checked up by weekly observation of the blood pressure. A recent patient came for treatment with a white cell count of 280,800. Within a short time after treatment was instituted the white cell count was 75,000. At the end of another week it was 18,000. After intensive treatment of this condition the patient becomes toxic from the proteid thrown into the circulation by the destruction of the cells of the spleen. By watching the blood picture and the patient one can tell when this toxemia is beginning to appear. The treatment should then be omitted until the patient fully recovers his equilibrium, when the treatment can be carried farther. The result in the patient mentioned above can be accomplished in practically every instance. The prognosis is more grave in the young than those more advanced in years, but in all cases life can be prolonged and the patient made more comfortable for a period of years. One should treat not only the region of the spleen but the long bones as well.

Of the malignant tumors, sarcomata respond more readily to massive doses of roentgenotherapy than do carcinomata. All types of sarcoma can be markedly improved

except the periosteal and the myelogenous. It is useless to treat either of these types. The periosteal type should always be treated by amputation where at all possible and the myelogenous type is always fatal, no matter what method of treatment is used. Lympho-sarcomata respond more quickly than any other type. One must be constantly on guard, however, that metastases have not passed beyond the point where treatment is administered. A favorite site for lympho-sarcomata is in the mediastinal glands. In practically all of these cases the retro-peritoneal glands have become involved before the patient seeks help. The retro-peritoneal glands are much more difficult to reach by roentgenotherapy than the mediastinal glands, and spring up afresh at the first opportunity and take the patient beyond our reach. I have a number of patients with small round cell sarcomata who have been well for more than five years following roentgenotherapy. I have several cases of giant cell sarcoma of the bone, beginning in the medulla and working its way outward, who have been entirely relieved by roentgenotherapy. I have one patient who had a sarcoma of the right kidney as large as his head who was entirely relieved by roentgenotherapy and remained well for one year. At the end of the year a metastasis was found in the right lung. This was treated by roentgenotherapy and entirely disappeared. The child lived for six months afterward, when a recurrence in the kidney and adjacent structures caused his death by gradual asthenia. The percentage of recurrences where roentgenotherapy is employed in the treatment of sarcoma is no greater than where surgical treatment is employed. There is no operative mortality rate, all of the deaths being due to recurrence or metastasis. These patients should be kept under observation for at least one year, a series of treatments being given after apparent cure, one every three months during the first year, and the patient reporting once every six months thereafter for observation.

Carcinoma: One of the ideal fields for roentgenotherapy is that of small epitheliomata about the face. These can be successfully removed without scarring and if the treatment has been sufficient in amount, recurrences will be few in number. The squamous cell type of epitheliomata responds much less readily to roentgenotherapy than the basal cell type, so that where one is treating the squamous cell type it is highly advisable to carry the treatment further than appears necessary. I give what appears to be sufficient treatment and then give an equal amount of treatment afterward, requesting the patient to return at frequent intervals for observation and to be sure and return at the first moment he notices any trouble.

I feel that all carcinomata other than the epitheliomata which are operable should be operated first and then roentgen treatment should be administered after operation. It is my feeling that the percentage of recurrences where this technique is employed will be much less than where either method of treatment is used alone.

There is a large field for roentgenotherapy in the inoperable carcinomata. Many of the patients come for roentgen treatment in a practically hopeless condition. By pushing the treatment to the limit, the disease will disappear to a remarkable extent. The patients will be free from pain and their lives will be prolonged for a considerable period of time. One of the most extensive cases which has come under my observation was that of a woman, 44 years of age, who had a carcinoma of both breasts, of the uterus and of the liver. She was unable to sleep or eat on account of pain and was bedfast when brought for treatment. We treated the whole torso, front, back and sides until her skin was tanned to a black walnut color. Both breasts became perfectly soft, all bleeding and discharge from the uterus ceased, although the uterus was still boggy, and the liver decreased in size until barely palpable. This patient lived eighteen months after beginning treatment and died with-

out pain. I have been able to accomplish the same thing in many other less extensive cases.

Roentgen treatment of inoperable carcinoma of the bowel is thought by many to be of little value. In my hands, however, it has been of great help. All bleeding can usually be stopped and the pain will disappear. The patient will gain slightly and will live for a considerable period of time. One patient who had an inoperable carcinoma of the terminal ileum and head of the cecum, had a short circuit operation done to relieve the obstruction and then received intensive roentgen treatment. A year and a half after treatment she walked into the office looking fine, weighing twenty-five pounds more than she had when under observation and feeling perfectly well. No mass was palpable at the site of the original growth which was as large as the fetal head. This patient is still living and in comfort after nearly two and one-half years. If nothing more than that could be accomplished, we feel that the effort has been well repaid.

Leukoplakia: Although many authorities claim that this disease is of syphilitic origin, it has never been my good fortune to observe a single case of this kind which did not sooner or later become carcinoma. In many of these patients there is a syphilitic infection as shown by the Wasserman test. These patients should receive anti-syphilitic treatment in conjunction with roentgenotherapy. Where massive doses of roentgenotherapy are employed, most of them will disappear. I recall one patient who had an extensive leukoplakia involving the inner side of the left cheek, extending over the gums on the upper and lower jaw directly on to the anterior pillar of the pharynx and over the tonsil. This patient was pronounced inoperable and recommended for roentgenotherapy. Under this treatment the growth completely disappeared and the patient has no sign of recurrence after a year and a half. There are some cases, however, which show marked diminution after treatment up to a certain point. Beyond this point, no matter

how much roentgen treatment is employed they fail to respond. It is our custom in these cases to use in conjunction with the roentgenotherapy, electro-thermic coagulation. By using a combination of the two methods the results have been very gratifying.

It would seem then that the essentials for success in deep roentgen therapy are high voltage, not less than 9¾ inch parallel spark gap, heavy filtration, not less than 6 mm. of aluminum, and massive dosage carried to the point of skin tolerance.

Case No. 7465—Mr. C. S. 18 Years

Patient complained of pain and swelling of the left side of face. The condition started eight months previous with what the patient termed a boil on the left side of the neck with the left side of the face swollen. During this time and previous to this the patient had been continually with horses and cattle. These were all healthy as far as the patient knew. He admits the habit of chewing straw and hay continuously. One month later, the boil was opened and a glass drain put in. The patient says this discharged a bloody pus and in about two weeks all swelling of the face and neck was gone but a small hard lump remained under the angle of the inferior maxilla. Then he was apparently well except for the lump and the spot where the glass tube was inserted, which would not heal. About six months later his face began to swell again and has remained so since. A few days ago he says that it broke open at the spot where the glass tube was previously inserted and it discharged a little.

Diagnosis: Probable actinomycosis. Confirmed later by microscopical examination of the pus.

Case No. 6754—Baby K. 4 Months Old

Shortly after birth a vascular nevus appeared in the left half of the upper lip. It has increased in size and now it involves the left half of the lip extending into the left nostril.

Results: She has had two series of deep therapy treatments combined with electro-thermic coagulation. The lip is normal in color and shape with scarcely a visible scar.

Case No. 4828—Mrs. F. S. M.

Seven years ago she began to be nervous and have heart trouble. Six years ago she was operated at the Mayo Clinic where they removed the left side and isthmus of the thyroid. Four years ago a baby girl came. There was no trouble. She continued well until December, 1916, when she began to feel

nervous and the right side of the neck swelled. Physical examination showed a large palpable right thyroid extending down behind the sternum. Her pulse was 120 and she was very nervous. Roentgenogram showed a large thyroid and possible thymus.

Results: She has had three series of deep roentgen therapy treatments and is entirely well after one year. She does her usual household and social duties with no return of symptoms. The tumor has entirely disappeared.

Case No. 6156—Mrs. G. G. W. 37 Years, Married, 3 Children, 7 and 14 Years

Last summer she was weak but did not consult a physician. In December, 1916, she was worse than better. In March, 1917, she went to a physician who found a lump under the left ribs. She has no pain but feels weak and dragging and has lost ''pep''. White blood count 74,000.

Diagnosis: Splenic Leukemia.

Results: She has had four series of treatments. When she came for treatment, June 11th, the white cell count was 74,000. On June 26th the count was 9,000 whites. Three months later the white cells had increased to 30,800. Four months later following the second series, the count was 15,000. At the end of seven months, with no further treatment, the white cell count was only 12,000.

Case No. 3521—Mr. J. H.

While helping with the relief work following the tornado, March, 1913, he received a severe bruise near the base of the left thumb. A lump appeared the size of a hen egg. It was painless. Roentgenogram showed it attached to the trapezium.

Diagnosis: Sarcoma.

Results: He was anesthetized and the growth fulgurated, then treated with roentgen ray to active erythema. He is still well, with no sign of metastasis or recurrence, four years after the last treatment and five years after the first treatment.

Case No. 7320—S. D. 7 Years, Schoolboy

For several months he has noticed a lump in the right axillary region. It is now the size of an orange, pushing the pectoral muscles forward. A section was removed for microscopic examination showing sarcoma. It was considered inoperable because of the surrounding axillary vessels. Roentgen treatment recommended.

Diagnosis: Sarcoma of the right axillary region.

Results: He has had only three series of deep treatments. The mass has entirely disappeared, the axillary region remaining normal for more than three years.

Case No. 6417—R. J. 4 Years Old

During the past six months he has developed a large tumor in the right kidney region with blood in the urine. It has been called sarcoma by three

physicians, the surgeon saying it is inoperable and recommending roentgen therapy. The mass is the size of a fetal head.

Diagnosis: Sarcoma of the kidney.

Results: He has had but two series of deep treatments. When he returned for the second series the kidney was not palpable. He has been under observation six months and has no evidence of recurrence.

Case No. 3592—Mr. F. M. 38 Years

About three years ago a barber picked a hair from the side of his face. He noticed pain immediately after. He went to a doctor the same day who incised the affected part. It did not heal. Five or six months later he was injured by a cow and a month after this, while eating a meal, he noticed a clear discharge from the side of the face run down on the outside. This was in the region of Stenson's duct. A few weeks later he was treated in the hospital for a month. He left and returned in a week at which time he was operated. He stayed in the hospital three months and was discharged with the sore almost healed. After being out some time the sore began to enlarge. It was treated in different places by different physicians without results. A year from the time he left the hospital he returned with the sore covering almost the entire right side of the face, with a very foul smelling discharge. The cheek was destroyed so that the molar teeth could be seen from the outside.

Treatment: He was referred for roentgenotherapy by the surgeon. One series of treatments carried to the point of vigorous erythema, resulted in eradication of the disease. Skin graft closed the opening in the cheek. He is still well after two years.

Case No. 5414—Mr. J. L. 76 Years

About twenty years ago he had a white looking place on the inner side of the left cheek and gum. It became hard like gristle. About six years ago it began to change, looking rough and red and becoming larger. There was not much pain, except when he pressed or moved the mouth.

Diagnosis: Carcinoma following leukoplakia.

Results: He is well fifteen months after treatment.

Case No. 7676—Mr. H. McG. 53 Years

Three months ago the left lower jaw became sore from pressure of a jagged molar tooth. He had the tooth extracted. He noticed an ulcerated area on the mucosa back of the teeth and milk white in appearance on the inner side of the cheek. He is a heavy smoker.

Diagnosis: Leukoplakia involving the anterior pillar of the pharynx, tonsil and root of the tongue. There are no palpable glands.

Results: After one series of treatments the growth has disappeared.

Case No. 2035—Mr. C. W. K. 42 Years

For several years he has had a sore on the lower lip which would not heal. He had it removed with caustic paste two years ago but it returned. One year ago it was excised but returned. Now he has a large ulcerated mass the size of a twenty-five cent piece on the lower lip. No lymphatic involvement was found.

Diagnosis: Epithelioma of the basal celled type.

Results: He has had nineteen treatments covering a period of four months. The growth has entirely disappeared and has remained well two and one-half years. The lip is as pliable as it was before the growth occurred.

Case No. 7649—Mr. T. M. 66 Years, Married

About one and a half years ago he had what he called a pimple on the right side of the nose. It grew rapidly. Five months ago he had arsenic paste applied. At that time it was the size of a walnut. He now comes with an ulcerating carcinoma covering the right half of the nose and the whole cheek with the eye completely closed.

Diagnosis: Rodent ulcer.

Results: He is now well after three months. There is an opening into the right side of the nose as shown in the photograph.

Case No. 6625—Mrs. H. E. N. 48 Years

In November, 1915, she began to have pain in the right part of the abdomen. After the pain disappeared she was troubled with constipation. This continued until July 13th when she was operated. She was said to have cancer of the bowel which was grown to the blood vessel and could not be removed. They made a short circuit to relieve obstruction.

Diagnosis: Inoperable carcinoma in the right iliac region.

Results: One and one-half years after treatment she is feeling fine and has normal weight.

Case No. 6622—Mrs. W. O. T. 38 Years, Married—5 Children

Eleven years ago she had repair and fixation. Seven years ago she had an operation on the right kidney and uterine suspension. One baby has come since each operation. Both births were normal. October 21st, 1916, she began to flow and has flowed constantly to date. She has had no miscarriages. She has had two currettements with no relief. No fibroid is present.

Diagnosis: Climacteric hemorrhage.

Results: She has had only one series of deep therapy treatments. The hemorrhage ceased entirely and has not recurred. She has been well more than one year.

Case No. 6626—Mrs. F. H. 44 Years Old

She weighs 90 pounds. Four years ago she noticed a lump in the right breast. July, 1915, she consulted a doctor who found trouble in both breasts. In 1915 she visited the Mayo Clinic where they found cancer of the uterus,

liver and both breasts. She was referred to Dr. Tyler for roentgen therapy, coming December 13, 1915.

Results: She has had eighty-seven treatments comprising fourteen series, covering the entire torso from the chin to the pubes—front, back and both sides. When she came she was bedfast and unable to eat or sleep because of the pain. Her pain disappeared, the uterine hemorrhage ceased, she gained weight, was able to sleep and eat anything she liked. She has been doing her own housework for more than one year. Both breasts are soft and the liver is barely palpable, while the uterus is still boggy.

FIG. 1. CASE NO. 6581
A case of lupus erythematosus before treatment. Entirely well to date, one year after treatment.

FIG. 2. CASE NO. 8550
Photograph of patient with ringworm, showing the method of clipping the hair preparatory to roentgen treatment. Entirely well after one treatment.

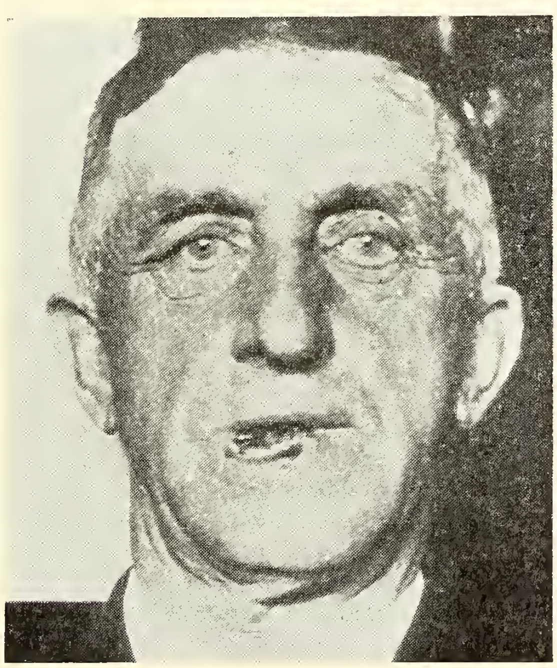

FIG. 3. CASE NO. 2035
Large epithelioma of the lower lip recurrent after removal by arsenic paste and later removed by resection.

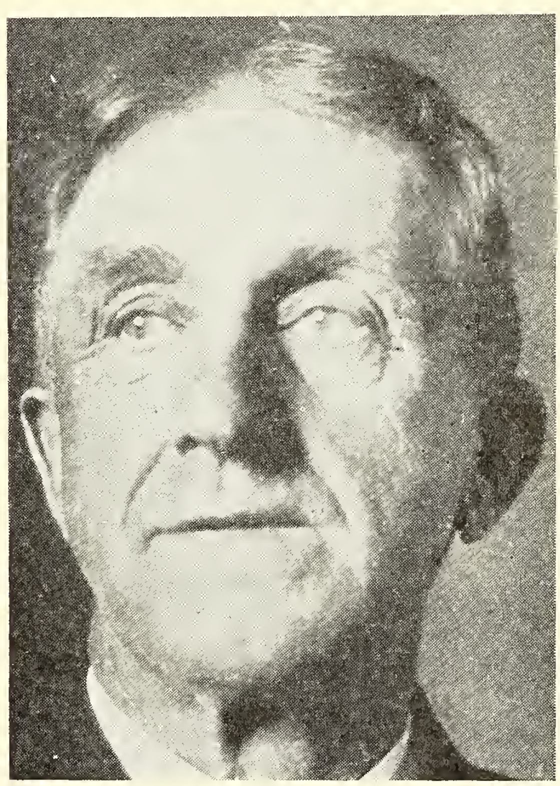

FIG. 4. CASE NO. 2035
Same patient three and one-half years after roentgen-therapy. Note the small amount of scar and the natural appearance and pliability of the lip.

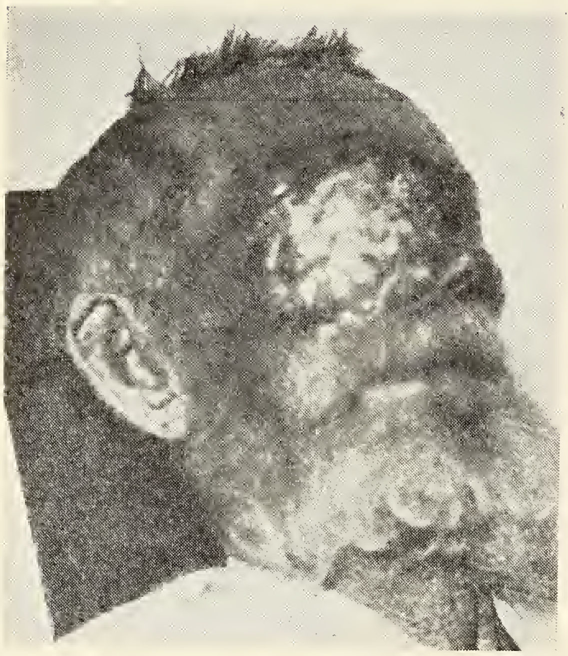

Fig. 5. Case No. 7649

Large epithelioma springing from the right side of the nose involving the right cheek, eyelid, and orbit. This was a recurrence after removal of an epithelioma from the side of the nose by arsenic paste. Entirely well after one series of treatments.

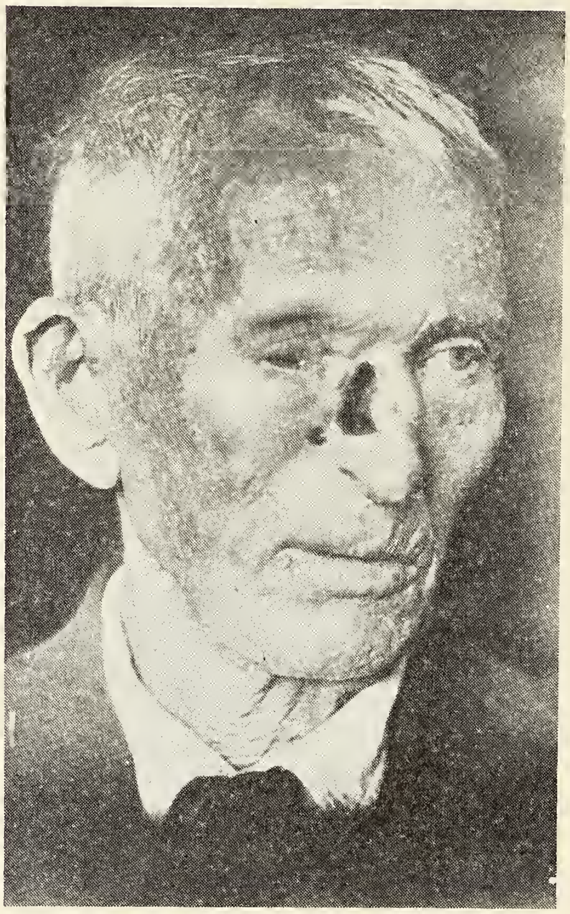

Fig. 6. Case No. 7649

Photograph after treatment showing the entire surface covered over with new skin except the hole in the side of the nose which had been produced by the destructive action of the arsenic paste.

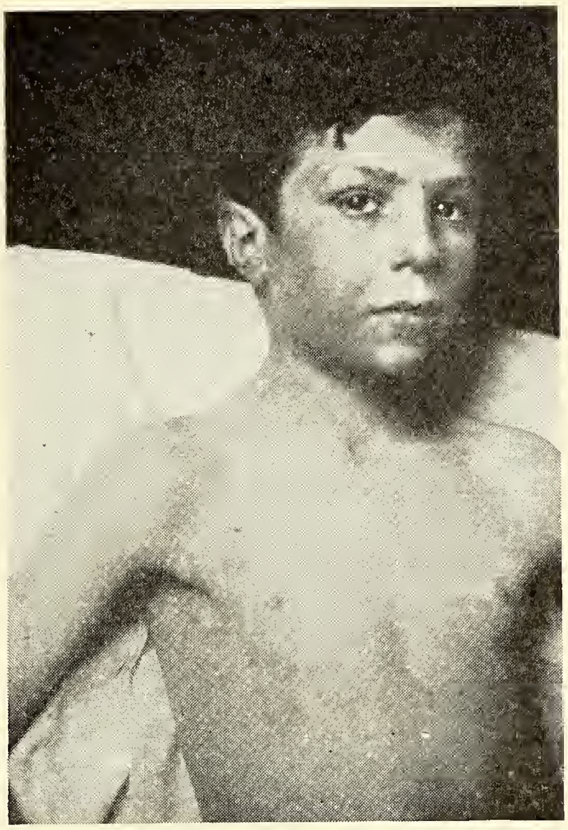

Fig. 7. Case No. 7320

Photograph of a little boy four years after treatment for inoperable sarcoma, the size of an orange, in the right pectoral region. The scar was made by removal of a section for microscopic examination. No evidence of recurrence to date, four years after treatment.

Fig. 8. Case No. 8472

Inoperable carcinoma of the right breast. The breast was fixed to the chest wall and there was marked enlargement of the axillary and supraclavicular glands. Entirely well after three series of deep roentgen treatments.

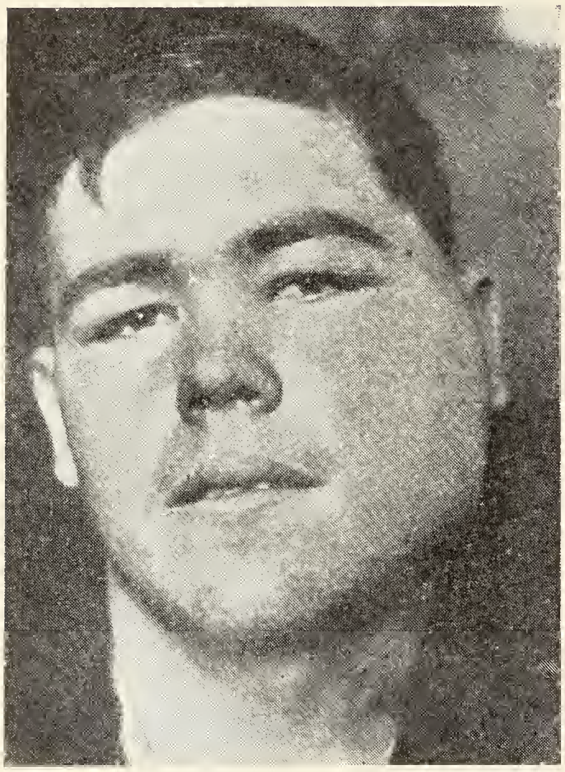

Fig. 9. Case No. 7465

Chronic case of actinomycosis, the fungi being found in large numbers on microscopic examination. Note the intense swelling of the parotid region and the sinus opening down on the neck.

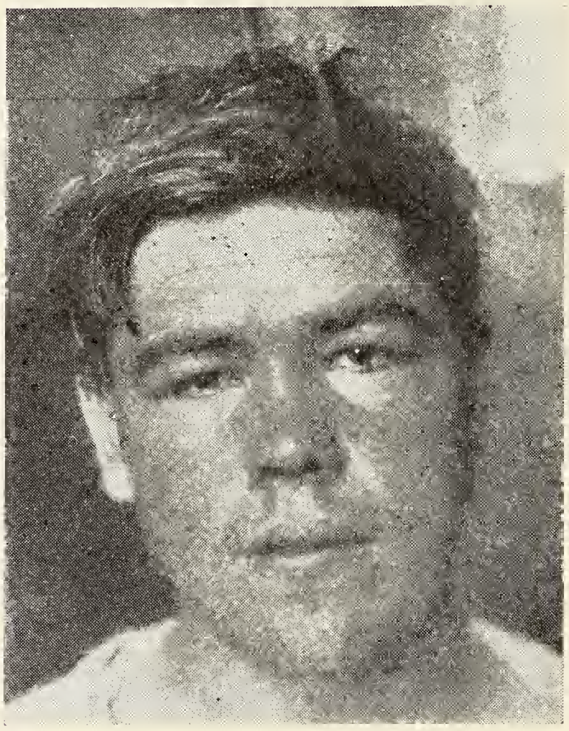

Fig. 10. Case No. 7465

Same patient as in Fig. 9, after treatment.

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Discussion

Dr. Henry Schmitz, Chicago: The work done by Dr. Tyler with the roentgen ray in the treatment of various pathological conditions is certainly remarkable, and the results obtained, as we have seen on the screen, are surely as good as we can possibly expect them.

Since my experience with radiotherapy has been chiefly in deep-seated pelvic carcinomata, I shall confine my remarks to that particular phase of radiotherapy. I began the treatment of these conditions with the roentgen ray, but very soon realized that my results were not very encouraging. I then treated these cases exclusively with radium from 1914 to 1915. Our primary results were very excellent, so that we could demonstrate local healing in about fifty per cent of the cases of inoperable carcinoma. Yet after a certain length of time, say within six to nine months, there were recurrences in the form of glandular metastases which apparently had escaped the action of the radium. Our patients began to go from bad to worse and finally succumbed. Therefore the results we at first obtained with radium were not much better than those which we observed from roentgen therapy. An investigation was made and it was found that our failures were due to the fact that the radium rays acted only in the immediate neighborhood of the capsule, while the action of the roentgen ray was more diffuse and, therefore, influenced large diseased areas. Thus we began to combine radium with roentgen therapy. Radium was inserted locally into the diseased organ and the roentgen rays used abdominally and through the small of the back to attack the areas which were the seat of extensions of the cancer disease and glandular metastases. Our results now were much better, though they seemed to be only temporary, *i. e.,* palliative. Recurrences would occur sooner or later, probably due to the fact that the rays had stunned the cancer cells but did not kill them outright.

In our early experience we had several cases which were subjected to surgery after a local healing by actinotherapy. These cases at the primary examination proved to be entirely inoperable, and under radium and roentgen ray treatment they apparently became operable. The disease became entirely localized in the organ. In uterine cancer the organ became freely movable, of normal size, and the infiltration which had existed in the surrounding areas disappeared in many of the cases. We thought that a radical operation at this time might give the patient a better chance. One of our patients, first operated in this way, lived for thirty-one months, when she finally succumbed to metastasis in the hypogastric lymph glands, having been physically incapacitated for only about three months prior to her death. We feel that this patient had been entirely relieved of her illness for twenty-seven months. Since then we have made it a rule that if a patient, after roentgen ray treatment and radium therapy, has a local healing we will subject that patient to radical removal of the diseased organ by surgical measures. In resorting to surgical measures we lay great stress on the technic. We insist that a knife shall not be used, but the incisions are made with the cautery. Any clamping along the broad ligaments is done with Downe's cautery clamps, so that we practically do not cause any auto-dissemination of any possibly active cancer elements which may have remained behind after the ray treatment. As soon as the patient has recovered from the operation, she is immediately subjected to combined radium and roentgen treatment.

I wish to show a few slides to illustrate the remarks I have made.

The first slide which I show you is from a patient who came to the Augustana Hospital March 15, 1914, with an inoperable carcinoma of the cervix. The chief symptom was a profuse hemorrhage which did not yield to an extensive cautery. About April 1st she was subjected to radium

treatment. She received in ten days two thousand one hundred milligram hours, and within three weeks she had a complete local healing. On bimanual examination it was an impossibility to detect any form of the disease. On April 21, 1914, an abdominal panhysterectomy was performed; the patient lived thirty-one months and then succumbed to metastases in the regional glands. Roentgen rays had not been used to combat any foci in the lymph-nodes.

The next case, a slide of which I show you, was one of inoperable carcinoma of the posterior cervix, involving the posterior vaginal fornix and traveling along the sacro-uterine ligaments and the anterior rectal wall. The patient was subjected to radium and roentgen ray treatment, and within four weeks there was complete local healing of her condition. About a year afterwards she returned to Chicago complaining of a severe pain along the right wall of the vagina. I became very much concerned about her condition and removed a portion of tissue from the seat of her former carcinoma. The microscopic examination showed fibrosis; it also showed that carcinoma cells had only been arrested in their viability. Their vitality was stunted by the radium and roentgen rays. The patient immediately had a recurrence which proved very refractory to treatment. She died from progressive carcinoma within six months after the excision of this piece of tissue. Perhaps a radical excision after a local healing of the carcinoma would have prevented recurrence.

September 3, 1918, Dr. Ochsner referred a patient to me with inoperable carcinoma of the cervix of the uterus. This carcinoma invaded the entire cervix and vaginal vault; the uterus was firmly fixed. As a matter of fact, it was embedded in infiltrated tissue to the extent that it was impossible to outline the uterus. The patient was subjected to the combined radium and roentgen treatment and within a month, that is, about October 6th, that patient returned to

Chicago. She had complete local healing without any trace of the former condition. We gave the patient another roentgen treatment combined with radium, and she returned to Chicago a few days ago to the clinic. Dr. Ochsner removed the uterus. I show you this uterus tonight so that you may see the condition of it after a combined radium and roentgen ray application. It shows the characteristic condition of general fibrosis of the uterus, which is especially marked at the internal os. The cervix is entirely free from disease. In fact there is no trace of a cancer.

There can be no doubt that in the treatment of malignant conditions of deep seated cancer, the combined radium and roentgen ray and surgical treatment is the treatment of choice. First cause a degeneration of the malignant disease with actinotherapy, then remove the diseased tissues as radically as possible by surgical measures, and again apply radium and roentgen rays to degenerate any cancer cells that may still have been left behind. This is the most advanced treatment that we can give to our patients and it holds out for them probably a greater degree of efficacy than any other procedure I know of.

Dr. William Allen Pusey, Chicago: I do not have anything in particular to say concerning Dr. Tyler's paper. He has covered so much ground that a discussion of it would take as much time as the paper itself because he touched upon the various topics as briefly as possible. In a general way I agree entirely with the various positions he took, allowing for such variations in judgment and experience as the personal equation requires in all these things.

I might say perhaps that I have reached the happy or unhappy stage of life when I can indulge in reminiscences, and as Dr. Tyler was reading his paper I could not help reminiscing about the history of x-ray therapy. As I see it now, it came around about the way it ought to come. It

went through a lusty, not to say somewhat noisy childhood; it had a puny and anemic period of adolescence, and finally arrived at a vigorous normal fully developed growth, where it is now. I went through the whole period, and my attitude about it has never changed. I read my first—or rather my first extensive—or second paper before the Chicago Medical Society about fifteen years ago, and practically every condition that was touched on tonight, except actinomycosis and uterine fibroids, was brought out in my paper at that time. I have no reason to change my attitude practically about anything except the very first condition I started to treat with the x-ray. I bought my original apparatus to treat hypertrichosis, and hypertrichosis is about the only thing that x-rays ever disappointed me in. The rest of its development has far exceeded any possible expectations that I might have had.

Dr. Tyler took up the variations that we see in cases and in this experience we commonly agree; he pointed out why one case proved intractable to treatment and another does not. I was reminded of my experience in that regard. In my first use of x-rays good fortune was certainly with me. The first case of carcinoma of the breast I ever treated was one Dr. Ochsner referred to me with an enormous mass of hypertrophic carcinoma on the chest wall. Under the use of the x-ray that thing vanished like magic, and the old lady, from being bedridden and unable to walk, regained her normal health and lived long enough to die of pneumonia about a year afterwards. The first case of Hodgkin's disease anybody ever treated was one that Dr. Ochsner sent to me. That child pursued the same course that Dr. Tyler outlined in his cases tonight. My first cases of numerous conditions gave as good results as I have had since; if they had been as resistant as some later cases I have had I probably would have given up the work in disgust. My experience with the x-ray has been consistent. I feel that I know what I can do with the x-ray the same as

I know what I can do with a hot poker. As I have been getting along in x-ray experience and experience with disease in general, I have been confirmed in my feeling that the x-ray is entitled to a very important place in our therapy.

Dr. C. W. Hanford, Chicago: I have a feeling of peculiar diffidence in approaching a discussion on roentgen therapy, owing to my woeful lack of knowledge of spark gaps and other technic concerned in the administration of the roentgen ray. I surmise the only reason I am asked to discuss this subject is because of the study I have given another gamma ray that emanates from radium.

I have listened with a good deal of interest to the paper and have learned one point from the essayist, and that is the high penetrating power of the newer roentgen ray. I had always been under the impression that the Gamma ray emanating from radium was thirty times more penetrating than that of the x-ray. If those of us who are handling radium could have our choice of cases, we would select the carcinomatous cervix, because these are a class of cases which respond most beautifully to the action of radium. Cases of carcinoma involving the rectum are very rebellious to treatment. I presume that all of us dislike to see a case of cancer of the tongue, although once in a while we can cause abeyance in the further inroad of the malignancy, but when there is hardness in the floor of the mouth the patient is literally doomed. We may arrest the process for a time.

The results obtained by the x-ray, as spoken of by the essayist, can be duplicated in the majority of instances by radium. If you have a large surface to cover and do not wish to go deep into the tissues the x-ray is of value. In carcinoma of the cervix you can accomplish definite results with radium in a radius of 2½ inches.

At a former meeting of this society I likened the x-ray to a machine gun that sprays the hills and valleys and strikes many of the foe, but some of them go unscathed,

while radium may be likened to a seventy-five millimeter shell, when it explodes there is something doing in that immediate locality. A combination of the x-ray and radium has proven successful in many instances. I do not attempt to handle the x-ray myself but turn these cases over to some one who makes it a study.

Just one word more. After a surgeon has finished his operation, his manual work is done, but his responsibility does not cease, and as long as we have two agents that have been tried and found valuable (the x-ray and radium) it would seem to be his duty to employ either one or the other as a prophylactic measure for the benefit of his patients.

Dr. Walter I. Le Fevre, Cleveland, Ohio: I wish to speak of just a few of the pathological conditions the doctor has brought out in his paper. In cases of lupus erythematosus I do not believe we are justified in using the x-ray because I think we have a better method of treatment with carbon dioxide snow. In these cases we have to produce a severe reaction, with destruction of tissue, in order to get a cure, and the result we would like to have is as nice a looking scar as possible, and I believe we can get a better scar with carbon dioxide snow than we can with the x-ray, without the danger incident when using the x-ray.

With reference to actinomycosis, I will say that it was my good fortune ten years ago to have such a case, which I rayed at that time, using fractional doses and repeating them often. The result was a perfect cure and the man is still well. This case was reported before the Cleveland Academy of Medicine at the time, and a report of it was published in the *Cleveland Medical Journal* with photographs before and after treatment.

Dr. Tyler mentioned the treatment of the thymus gland in conjunction with the treatment of hyperthyroidism. We should have our attention called to the value of this in the treatment of enlarged thymus in children. I believe it is well recognized as the only cure for this condition, but I do

not believe we fully realize the number of cases we have nowadays. Of course, a good many of these children recover without a diagnosis or treatment, but there are many others that die without a diagnosis or treatment.

I would like to mention another condition which has been satisfactorily treated with the use of the x-ray, although the essayist did not refer to it, and that is the treatment of chronic laryngitis. I have had a few of these cases that I have treated with the x-ray and the results have been very satisfactory indeed. These cases I have treated with a moderate deep dose filtered through two millimeters of aluminum, and repeated once a week. It has been remarkable to see how these cases have cleared up and have remained well up to the present time. While my experience has been limited in these cases, yet I think it has been sufficient to be worth reporting.

Dr. Tyler (closing the discussion): I wish to thank the members of the Chicago Medical Society and the members of the Western Roentgen Society for the invitation to appear before you, and for your close and marked attention to the paper and for the excellent discussion. So broad a subject as this could not be covered in so short a paper, so that I appreciate the additions which have been given during the discussion.

Dr. Hanford spoke about the greater penetration of radium as compared with the x-ray. Radium has an action through 5 cm. of tissue as proven by the microscope, while x-rays penetrate much further. To me the chief advantage of the x-ray over radium is the fact that we have so much larger quantities of the rays along with the great penetration which is possible, associated with very high voltage and very heavy filtration. On the other hand, the advantage of radium is that it can be inserted in the body cavities which are not accessible to the x-ray. By using the two together we get very excellent results, the one supplementing the other.

City National Bank Building

CLINICAL RESULTS OBTAINED IN SIX HUNDRED AND TWENTY-FIVE CASES OF VARIOUS PATHOLOGICAL CONDITIONS TREATED WITH RADIUM AND ROENTGEN RAYS

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From April 1, 1914, to October 1, 1918, we treated 625 patients with either radium or the roentgen ray or with a combination of these two or a combination of radio-therapy and surgery. The cases may be clinically divided as follows:

Carcinomata	423
Sarcomata	39
Benign genital tumors, etc.	4
Tuberculous disease	31
Benign skin lesions	24
Diseases of the thyroid gland	10
Spleno-myelogenic leukemia	7
Splenomegaly	1
Uterine hemorrhages	85
Actinomycosis	1
Total	625

It is immediately seen that most of these diseases are usually surgically treated. If we decided to apply radium or roentgen rays we did so because either surgery could not benefit the patient any more, while the rays gave some hope of palliation, or the rays would increase the efficacy of surgical treatment, or actinotherapy proved to be superior to surgical methods of treatment.

To enable us to decide whether a patient should be subjected to radium or the roentgen treatment or a combination of these with surgery or to surgical methods only, we should endeavor to answer these questions:

1. What can surgery accomplish in the treatment of disease?
2. What therapeutic value have radium and roentgen rays in the treatment of disease?
3. Are there any differences in the action of radium and roentgen rays?

465 patients were treated for malignant growths and 89 patients for potentially or conditionally malignant disease —a total of 551 cases, or 87.7 per cent. Hence to facilitate matters we will chiefly apply the answer to the above questions to the treatment of malignant, potentially and conditionally malignant diseases.

We are using the term clinically or conditionally malignant advisedly. By it we interpret a disease which is progressive in nature either objectively or subjectively or both, and finally kills the host either by its continued local growth and extension or by the progressively abnormal functions or by both. For instance an ovarian cystadenoma usually kills by its progressive growth, a myoma by its continued bleeding. A potentially malignant disease may show histologically not a single cell characteristic of being malignant. Yet we know from clinical experience that the patient usually develops carcinoma, *e. g.,* papilloma of bladder, chronic mastitis and so forth.

An anatomical cure of a malignant disease can only result from a complete eradication of all tumor elements from the body of the bearer. If the malignancy is confined or localized to an area which can be completely and safely removed by a surgical procedure, it must be thus treated. The malignant disease is said to be operable. If the patient survives a time-period of five years following the surgical treatment, and during this time has been free of any recurrence or metastasis, he is said to be cured. It is, unfortu-

nately, only very rarely that we observe cancer in such a localized, well defined state, that is, in its incipiency.

If the malignant growth has invaded the surrounding or distant tissues and organs to such an extent that we cannot remove the disease with the knife and with safety to the patient, a cure by surgical measures is absolutely precluded. Contrary we cause an auto-dissemination of malignant cells which rapidly leads to either a carcinomatosis or we irritate the tumor and cause it to grow with a boundless velocity. The patient has not been benefited by such therapy but has been rendered much more miserable than he would have been if left alone. The cancer has become inoperable and therefore hopeless. The absolute operability of a cancer can be determined with difficulty only. In about nine out of ten cases the patient comes to the surgeon at a time when the disease is beyond his reach. These facts explain the discouraging results of surgery in almost all forms of malignant disease in the human race.

In answering the second question we must consider the biological action of the rays on normal and abnormal tissue and cells. This action depends on the technique used in the administration of the rays and the histological character of the cell in which they become absorbed.

The factors observed in the use of radium are (1) the amount and compactness of the radium element used; (2) the filtration employed; (3) the distance between the source of the radiation and the tumor; (4) the duration of the application; and (5) the time interval between subsequent applications. In the therapy of the roentgen ray we must observe (1) the source and the amount of the secondary current; (2) the size and kind of tube; (3) the hardness of tube; (4) distance of the anode from the tumor; (5) the time-period of duration of the application; and (6) the interval observed from one course of treatment to the next.

The effect of rays on living cells is both degenerative and destructive. The nearer the cells approach or remain in an

undifferentiated, embryonal state, the more readily they undergo cytolysis or destruction. It does not matter whether the cells are normal or abnormal. This difference in the receptivity or sensitiveness of cells to the rays depends (1) on their age, both the momentary phase of the developmental period in which they happen to exist as well as the age of the host to whom they belong, and (2) on the histologic species and the varieties in each one of these.

Cells which are in, or have not advanced far beyond, the embryonal and undifferentiated state as the basal cells of the skin and hair follicles, lymphoid cells, sex cells, as graafian follicles and spermatozoa, are destroyed by a dosage of rays which would excite only a simple reaction in the surrounding mature tissues. The tissues of a child are much more easily altered by the rays than the corresponding structures in an adult. Tumors composed of embryonal cells succumb to the action of the rays sooner than the surrounding adult tissue elements. The difference in receptivity is acknowledged to be about as seven or six to one. The more undeveloped the embryonal cells of a malignant tumor remain, the more rapidly will the cells proliferate and the more receptive will they be to the action of the rays from radioactive substances.

An impediment in the growth of the tumor occurs soon after the beginning of the treatment. It is due (1) to a serous infiltration occurring in the area exposed to the rays, an enlargement of the cell nucleus causing an increase in the size of each individual cell and an obliteration of the capillaries due to an increase in the size of the endothelial cells; (2) to a degeneration of the cell nucleus evidenced by cessation of mitosis, pyknosis, cytolysis and achromatism. These changes are of a traumatic nature and call forth an inflammatory reaction resulting in a lymphocyte and leukocyte infiltration, and a proliferation of the stroma. The latter is expressed by an enormous formation of young fibroblasts, which gradually develop into highly differenti-

ated connective tissue cells and fibers. An excavation of portions of the tumor results. The spaces thus formed are filled by granulation and connective tissue which become covered by epithelium if degeneration occurred, or by scar tissue if necrosis took place.

The round cell infiltration and fibroblastic proliferation have still another significance. Their phagocytic faculties are instrumental in removing the debris of the necrobiotic cell elements. We do not wish to advance the impression that a microscopic examination of scar tissues would show a total absence of all abnormal cell elements, on the contrary, abnormal cells are always demonstrable on microscopic examination, although they are in a state of degeneration shown by absence of mitosis and every known variety of karyolysis, cytolysis and achromatism. It is impossible to state whether these abnormal cells are dormant, or whether they are absolutely harmless and dead. Prime,* in a recent publication, considers that these processes affect the cell nucleus in preventing further mitosis. Such radiumized tissue will not grow when inoculated in mice. Radium does not kill the cells outright, but injures the nucleus in such a manner as to prevent further division which must eventually result in the death of the cell if its energy is expended in growth and division and not in a purely mechanical function.

The histologic changes in other tumors or tissues are identically the same, namely, impediment in the proliferation of the pathologic cell element and its subsequent death, round cell and connective tissue infiltration and phagocytosis, and finally heavy cicatrix formation, which is poor in blood supply and often resulting in a hyaline degeneration and softening, or connective tissue regeneration. The latter becomes covered with epithelium richly supplied

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*Prime, F.: Observations on the Effects of Radium on Tissue Growth in Vitro, *Journal of Cancer Research,* April, 1917, 2.

with capillaries, while the former remains without an epithelial surface covering, but possesses a heavy, grayish pseudomembrane. See figures 1, 2, 3, 4 and 5.

The technique of roentgenotherapy has been developed to a very exact state, that of radium is in its infancy, therefore by no means as yet perfect. We are still at variance whether the radium salts or its emanation should be used, whether large or small amounts should be employed, whether the duration of the application should or should not avoid any visible injury to the tissues such as burns and necrosis, whether we should filter out the beta-rays or use both beta and gamma rays. Personally, I incline to the view that we must treat the disease and not the patient. The surgeon is most successful in the treatment of malignant diseases who is most radical, who dares to work far out into the healthy tissues. Consequently the farther reaching a degeneration or destruction of tissue is brought about by the rays, the better the remote results of radiotherapy must be.

Lastly we must determine when to use radium rays and when roentgen rays. The therapeutic action of radium is confined to a radius of four centimeters, hence is purely local. That of the roentgen rays emanating from a correctly adjusted Coolidge tube is far more intense and much more diffuse. The therapeutic intensity of both can be multiplied by the crossfire method using as many portals of entrance as practicable in a given region of the body. Painstaking thoroughness and an unerring system bespeak wonderful results. We use radium in the body cavities applying it directly into or against the tumor mass and in surface carcinomata when purely local action is desirable. In all other instances we prefer the roentgen ray.

The conclusions drawn from these statements may be briefly summarized as follows: Surgery removes diseased tissues and organs but cannot modify their pathological state. The gamma rays of radium element and the filtered roentgen rays can modify abnormal cells but cannot remove

them. Therefore it is evident that a combination of these two methods of treatment would increase the efficacy of the one or other in many instances.

These are the viewpoints which we at present observe in the treatment of malignant or potentially malignant diseases. First, we ray with the combined gamma rays of radium and the hard filtered roentgen rays to degenerate the abnormal cells; secondly, we eradicate the diseased tissues and surrounding areas surgically if one can do so and by measures as radical as possible, and finally we again apply the combined radium and roentgen rays as thoroughly as permissible to destroy any diseased cells or cell nests that inadvertently may have been left behind after the surgical eradication.

Prior to April, 1914, we only used the roentgen rays either as a prophylactic following radical excision of disease, or as a palliative in inoperable cases. The results were very discouraging, excepting selected cases of myomata uteri, hemorrhagic myopathies and a few mammary carcinomata.

From April 1, 1914, to about April 1, 1915, we used radium rays either as a prophylactic after operations or as a palliative in inoperable disease. The primary results were very encouraging. We observed about 50 per cent of local healing in inoperable carcinomata. However recurrences were the infallible rule. These occurred mostly in the parametrii and regional lymph glands.

Since April, 1915, we, therefore, used the combined treatment of radium and roentgen rays, the former attacking the tumor locally and the latter acting on the surrounding tissues and organs and regional lymph glands. The technique used has been given in a postscript at the end of this paper.

We observed many cases of inoperable malignancy which were rendered entirely free of any palpatory abnormal findings. As early as April, 1914, we decided to subject quite a

number of these cases to radical excision by surgical methods. We used the electric cautery forceps of Downe either vaginally or abdominally, and then followed the operation by radiotherapy. We had many brilliant results. Finally we made it a rule to subject all cases of malignancy, whether operable, inoperable or border-line cases, to a preliminary treatment with radium and roentgen rays, followed by an operation if the local and constitutional condition warranted the procedure and then again applied radium and roentgen rays to preclude recurrences if possible. We are convinced that this plan forms the most ideal and advanced procedure of treatment in suitable cases.

In the following paragraphs each disease entity is classed seriatim:

Carcinomata

Uterine: operable 21; inoperable 87; recurrent 40........total	148
Rectal: operable 5; inoperable and recurrent 38.......... "	43
Genito-urinary: operable 1; inoperable and recurrent 31... "	32
Mammary: operable 13; inoperable 11; recurrent 36...... "	60
Skin	34
Superior maxillary bones, including ethmoids and palate	14
Inferior maxillary bones	13
Buccal mucosa	9
Long bones	1
Larynx	3
Glands	13
Tonsils	4
Mediastinum	5
Tongue (2 leukoplakia)	16
Esophagus	8
Stomach	7
Bowel	6
Pancreas	1
Pseudomyxoma peritonei following ovarian papillomatous cyst	6
Grand Total	423

Sarcomata

Lymphogranuloma	5
Penis	3
Mucosa	4
Bone	4
Head and face	2
Hodgkins disease	1
Facial sarcoma	8
Nose	5
Lymphosarcoma	3
Melanosarcoma	2
Neurosarcoma	1
Parotid	1
Grand Total	39

Tuberculosis

Lupus vulgaris	3
Lupus erythematosis	5
Larynx	1
Peritoneum and abd. organs	3
Bone	3
Adenopathy	11
Kidney	1
Female pelvic organs	4
Grand Total	31

Benign Skin Lesions

Keloid	8
Blackmole	2
Winemark	2
Birthmark	1
Cavernous hemangioma	4
Verruca	2
Sarcoid	1
Lipoma	1
Eczema	3
Grand Total	24

Thyroid Gland

Hyperthyroidism	3
Exophthalmia	4
Simple	3
Grand Total	10

Blood

Spleno-myelogenic leukemia	7
Spleno-megaly	1
Grand Total	8

Benign Lesions of Female Genitalia

Myomata uteri	25
Hemorrhagic myopathies	50
Inflammatory myopathies	8
Leukoplakia vulvae	1
Kraurosis vulvae	1
Grand Total	85

Benign Lesions of Male Genitalia

Papillomata of urethral mucosa	1
Hypertrophy of prostate	2
Actinomycosis	1
Grand Total	4

Total Number of Cases, 625

The gross clinical results obtained in the more important of these diseases are as follows:

Uterine Carcinomata

	LIVING	DIED*	NOT HEARD FROM	TOTAL NO.
Operable uterine carcinomata with pre- and post-operative raying	36–38–19 months	12–3 months	1	6
Operable carcinomata with postoperative raying only	44–43–8–7–2 months	4–19–3–24–15–7–1 months*	3	15

Of cases treated both prior to and after operation 50 per cent are living.

Of cases treated only after operation 33 per cent are living.

The patients living have been recently examined and are free of any recurrence.

*Average duration of life in those who died is 11 months.

	LIVING	DIED*	NOT HEARD FROM	TOTAL NO.
Inoperable uterine carcinomata with rays and operation	19 months with recurrence 15 months free of recurrence	9–3–31–5–5–8–7–11–8 mths.	2 died from septic peritonitis following operation	13

*Average duration of life in those who died is about 10 months.

	LIVING	DIED*	NOT HEARD FROM	TOTAL NO.
Inoperable uterine carcinomata treated with rays only	1— 3 months	2 after 1 mth.	15 did not report	
	1— 4 "	6 " 4 "		
	5— 6 "	3 " 3 "	6 died from effects of treatment	
	1— 8 "	2 " 4 "		
	2—11 "	1 " 5 "		
	1—12 "	1 " 6 "	5 too early to report	
	1—13 "	1 " 8 "		
	1—16 "	3 " 9 "		
	2—17 "	3 " 10 "		
	1—21 "	1 " 11 "		
	1—30 "	2 " 12 "		
		1 " 16 "		
		1 " 21 "		
		2 " 24 "		
		1 " 26 "		
		1 " 36 "		
	—	—	—	
	17	31*	26	74

*The average duration of life was 9+ months.

	LIVING	DIED*	NOT HEARD FROM	TOTAL NO.
Recurrent uterine carcinomata	24–24–15–4–4–4–2 months	10–5–6–9–6–9–15–5–8–3–15–19–15–6–6–6 4–9–6 months	9 did not report 5 died from op. procedure chiefly sepsis	
	7	19	14	40

*Average duration of life was 8⅓ months.

Rectal Carcinomata

Operable		*Inoperable*			
LIVING	DIED*	LIVING	DIED†	NOT HEARD FROM	TOTAL NO.
33–13	12–26–16	24–22–18–15–13–8–6–4–4–4–4–3–2–2	6–3–17–6–30–6–6–2–6–9–8–6–3–7–4	8 1 died after colostomy	
2	3	14	15	9	43

Percentage living after one year 20 per cent.
*Duration of life of those *operable,* 18 months.
†Duration of life of those *inoperable,* 7½ months.

Genito-Urinary Carcinomata

Operable		*Inoperable*			
LIVING	DIED	LIVING	DIED	NOT HEARD FROM	TOTAL NO.
	3	16–36–27–18–9–7–7–6–8–7–4–4–5–3–5–2	5–2–6–6–8–6–2	4 2 died from urethral fever and subsequent congestion of kidneys 1 died from advanced ca. soon after beginning of treatment 1 died from sepsis after cautery	
	1	16	7	8	32

Mammary Carcinomata

Operable			*Recurrent*			*Inoperable*		
LIVING	DIED	NO REPORT	LIVING	DIED	NO REPORT	LIVING	DIED	NO REPORT
32–22–20–	1	1	34–21–17–	46–9–3–9–	4	21–7–5–3	6–2	1 shock
19–15–13–			17–15–13–	15–8–½–				4
7–5–4–4–5			13–9–12–	6–24–28–				
			9–4–11	3–4–16–				
				17–2–3–				
				11–9–9–1				
11	1	1	12	20	4	4	2	5

Operable mammary cancers living 11; died or no report 2; *i. e.,* 85% living.

Recurrent mammary cancers living 12; died or no report 24; *i. e.,* 33+% living.

Inoperable mammary cancers living 4; died or no report 7; *i. e.,* 36% living.

Carcinomata of Head, Trunk and Extremities

	LIVING	DIED	NO REPORT OR OTHERWISE	TOTAL
Skin:	30 30	1 at 12 months 1	3 3	34
Superior Maxilla:	48–3–3 3	6–3–3–6–5–3–0 7	3 1 died Emetine Injection 4	14
Inferior Maxilla:		8–5–7–3 4	6 3 died following excision 9	13
Mucosa:	30–26–23–3 4	12–12–11–4 4	1 1	9
Long Bones:			1 1	1
Larynx:		3–1 2	1 1	3
Glands:	30–10–3–3 4	6–8–2–4–9–1 6	2 1 died from hemorrhage after cautery 3	13
Tonsils:	2 1	5 1	2 2	4
Mediastinum:		3–2–3–2–1 5		5

	LIVING	DIED	NO REPORT OR OTHERWISE	TOTAL
Tongue:	Leukoplakia 52–3 Carcinoma 55–9–6–5 6	2–7–8–18–6–3 6	3 3	15
Stomach:	16 1	1–6–7 3	3 3	7
Bowel:	15–14 2	1–6–17–4 4		6
Esophagus:	7–5 2	1–1–3–438 4	2 2	8
Pancreas:			1 1	1
Pseudomyxoma Peritonei:		6–48–1 3	3 3	6
Total:	53	50	36	139

The results obtained in the treatment of carcinomata are of course without any statistical value, as the time honored period of five years has not yet elapsed in a single instance. If we compare the results with purely surgical statistics as given by Reuben Peterson, John G. Clark, Howard Kelly, Krönig, James F. Percy and Mayo amongst others, we may be permitted to regard the results as very encouraging and promising. They may not be as brilliant as those obtained by Kelly and Burnam in uterine carcinomata, or Janeway in cancers of the jaw, yet they compare favorably with those reported by John G. Clark, The London and Manchester Radium Institutes and the Harvard University Cancer Commission. A perusal of our results in mammary cancers proves the obvious value of radiotherapy in operable as well as recurrent and inoperable cancers. The fact that the results in mammary cancers are better than in pelvic malignancy may be explained by the greater technical difficulties in diagnosis and surgical as well as ray treatment in the latter.

Sarcoma

	LIVING	DIED	NO REPORT	TOTAL NO.
Lymphogranuloma:	22–8 2	9–16–1 3		5
Fascial Sarcoma:	48–2 2	6–5–6–6 4	1 1 died amputation of shoulder 2	8
Penis:	48 1	1 1	1 1	3
Nose:	21–4[1] 2	3–4 2	1 1	5
Mucosa:	39–35 2	4–7 2		4
Lymphosarcoma:		1–1 2	1 1	3
Bone:	25[2]–3 2	232–7 2		4
Melanosarcoma:		6–4 2		2
Head and Face:	16 1	4 1		2
Neuosarcoma		5 1		1
Hodgkin's Disease:	10 1			1
Parotid:	10 1			1
Total:	14	20	5	39

[1] Followed by cautery.

[2] Recurrence; amputation of forearm Nov. 7, 1918.

Round celled sarcomata respond very readily to the rays, no matter whether the tumor is a true sarcoma or a melano sarcoma. Spindle celled sarcomata prove very refractory. Wherever possible Coley's vaccine was given to these patients especially if radiotherapy proved refractory.

Tuberculous infections respond very favorably to radium and roentgen rays. We treated five cases of lupus erythematosis which were healed and three cases of lupus vul-

garis which improved but usually require reapplications on account of a tendency to recur.

Tuberculous adenopathies offer a very admirable field for radiotherapy. Reaction is almost immediate and leads to a complete disappearance of the glands. Eleven adenopathies were treated and are well.

Seven cases of tuberculosis of abdominal organs and the peritoneum have been subjected to roentgenotherapy with an arrest of the disease and probably complete disappearance in six cases, while the seventh, a tuberculous enteritis, is of too recent a date to permit of any conclusions. The tuberculous kidney, apparently, does not yield to the ray treatment. I also must omit an opinion of the value of the ray in tuberculous bone lesions. The cases have been very recently treated.

The diseases of the thyroid gland have been only partly benefited by the treatment. We observed diminution in the size of the gland and also the symptom triad of tremor, tacchycardia and exophthalmos. We are inclined to attribute to the usual medical and surgical treatments superiority in comparison with actinotherapy. However, the latter should form a valuable adjunct to medical treatment and be of benefit prior to partial thyroidectomies when they may cause an amelioration in the tachycardia and hyperthyroidism. Danger to cause disfunction of the parathyroids is obviously great and should always be thought of.

We do not know of any remedy that will cause reduction of splenomegaly in splenomyelogenic leukemia more promptly than radium. At the same time the blood rapidly changes to an almost normal state. Older cases, however, are much more refractory. In every instance, a relapse would occur within a very short time, usually about two months, and the reaction to radiation would be much slower. As long as the spleen remained of a nearly normal size, the corpuscles also seemed to remain normal. With increase in size of the spleen, the typical blood picture would also reoccur. We, therefore, subjected every case to a splenec-

tomy. Of the seven cases treated, three have remained apparently well, one was absolutely refractory, the patient being in the final stages of the disease, one has a recurrence, and two died from shock following the splenectomy.

A patient suffering from actinomycosis yielded promptly to the rays. Internally large doses of potassium iodid, as advocated by A. J. Ochsner, were given at the same time. The patient has now been well for more than two years.

Eighty-five cases of benign diseases of the female genital organs were treated by actinotherapy. Fifty had a hemorrhage and eight an inflammatory myopathy; twenty-five myomata uteri, one a leukoplakia and one a kraurosis of the vulva. The indications for the ray treatment are the presence of an essential menorrhagia or an essential leucorrhea in the myopathies and uterine hemorrhages in the myomata which do not yield to medicinal treatment. Submucous pedunculated, cervical and degenerating myomata must not be rayed. Complicating pathology in the adnexa, also, forms a contraindication. The possibility of the presence of malignancy must be absolutely excluded before treatment is instituted. If in doubt radical excision must be practiced. Procrastination would be criminal. Amongst the hemorrhagic myopathies we had one recurrence, amongst the inflammatory myopathies three failures, and amongst the myomata two negative results. The leukoplakia vulvae yielded to the rays, while the kraurosis did not even improve.

In conclusion we feel justified to formulate the following principles:

1. Operable carcinomata should receive a preliminary application of radium and roentgen rays to cause a degeneration of the abnormal cells. Subsequent radical extirpation which preferably should be done with cautery knives and clamps must be followed by another course of radium or roentgen therapy or both, to insure as intense a degeneration of the disease area as possible.

2. Radium and roentgen rays form the ideal palliative

Cures are very few. The advantages as a palliative are, however, superior to any other known method. Whether surgical eradication should be recommended after a local cure has been obtained by radiotherapy cannot as yet be stated. Microscopic examination of radiumized tissue seems to justify such a procedure.

3. The tuberculous skin lesions, adenopathies and abdominal infections are greatly benefited by the rays. In fact, they should supersede the therapeutic methods until now advocated for these infections.

4. The rays form a valuable adjunct in the treatment of diseases of the thyroid gland. They should not replace the medical and surgical treatment, as the results of these are far more positive.

5. Spleno-myelogenic leukemias show a decided remission when treated with radium. Theoretically, from a physiological and pathological standpoint, the value of splenectomy seems to be unscientific. However our clinical experience tends to favor removal of the spleen.

6. Round celled sarcomata readily yield to radiotherapy, while spindle celled tumors are very refractory. Simultaneous administration of Coley's vaccine is of great value.

7. In the benign hemorrhagic diseases of the uterus and the inflammatory myopathies radium has proven of the utmost therapeutic value. Without causing mutilation it brings about a cessation of the hemorrhages and leucorrhea and very frequently a disappearance of the myoma.

N. B. The technique employed in our work may be best studied from the accompanying reproductions, which also show the various filters and applicators used. They have been constructed so that all parts may be interchanged.

The radium tubes contain approximately 50, 32.5, 25, 25, 25, 25, 17.5 and 15 milligrams element. The filters used for internal work can be filled with any combination of these tubes up to 100 milligrams. The 15 milligram tube of radium is contained in a platinum needle with an iridium

point. It may be thrust into the tumor substance, for instance through the perineum into a lobe of the prostatic gland under guidance of a finger in the rectum, or into the substance of the tongue and so forth.

As the therapeutic action of radium extends to a radius of 4 cm. from 75 to 100 milligrams of radium element are inserted into the uterus, if that organ is the seat of a carcinoma. The ''bomb'' may carry up to 100 milligrams and is placed directly against the cervix and vaginal vault if an extensive involvement of the vaginal portion of the cervix and vault are present. The rays will cause a degeneration of carcinoma tissue within a radius of 1 cm. within eight hours, within 2 cm. within 32 hours and within 3 cm. within 72 hours and so forth. Therefore a given tumor is exposed to the action of the rays for 72 hours, this being accomplished by three séances of 24 hours each at intervals of 10 days. The dosage for tumors in other regions of the body is identical with the description for uterine treatment.

The arrangement of the capsules is as follows: The radium is contained in silver or brass capsules of a wall thickness of 0.5 mm. These capsules are inserted into a filter made of brass of a wall thickness of 0.7 mm. The filter is then surrounded by a rubber tube (fountain pen filler) of 3 mm. thickness. A thread is attached to the filter cap, which is secured with a safety-pin to an abdominal binder.

In surface applications one must use a shorter period of application to guard against any late secondary necrosis of tissue which may be permissible in internal applications, but are detrimental to a good cosmetic result in surface applications. Nevertheless, if raying for carcinoma this is entirely overlooked. In noting results we observe (1) the arrangement of the radium capsules; (2) the distance of the capsule from the tumor tissues; (3) the method of filtering; (4) the duration of each séance; (5) the interval between séances; (6) the histological structure of the tumor,

if biopsy is advisable; (7) the comparison of the various examinations preceding each séance of treatment; (8) the visible effects of radium on the tissues as erythema, burns and so forth. This is of importance to correctly interpret the latent action of radium on tissues. See figures 6, 7, 8 and 9.

The technique of the roentgen ray therapy has been rendered so exact in its minutest details that carelessness or neglect are impossible. The best description is furnished by the reproduction of figure 10 which shows our procedure in breast cancers. To each square 50 milliampere minutes are applied. The Coolidge tube must take a spark of nine inches, the milliamperage being 4 to 5; the rays are filtered through 0.5 mm. of zinc, the secondary rays forming in the zinc filter are arrested by the distance between it and the body surface, it being placed about halfway between tube and body surfaces. The distance of the anode from the body surface is 21 cm. With such an arrangement we obtain about 3 E. doses, *i. e.,* 30 X or 15 H within 10 minutes. According to Bumm's researches 3 to 5 E doses will destroy carcinoma tissue within one centimeter from the body surface, but it takes 7 to 10 times this amount to obtain similar results near the posterior bony pelvic wall, the seat of the glandular metastases in cancer of the pelvic organs. By using multiple portals of entrance we may succeed in obtaining the same therapeutic results in the tissues adjacent to the posterior bony pelvic wall. We must tilt the tube so it will always be directed to the same area within the pelvis. The number of fields must be determined for each individual case and depend on the diseased organ, the extent of the infiltration of surrounding structures, the region of the body and the location of the regional lymph nodes. An interval of three weeks is observed between each course. The latter is crowded into the smallest possible space of time, that is, they are usually applied in one sitting. From three to four courses are given in each case.

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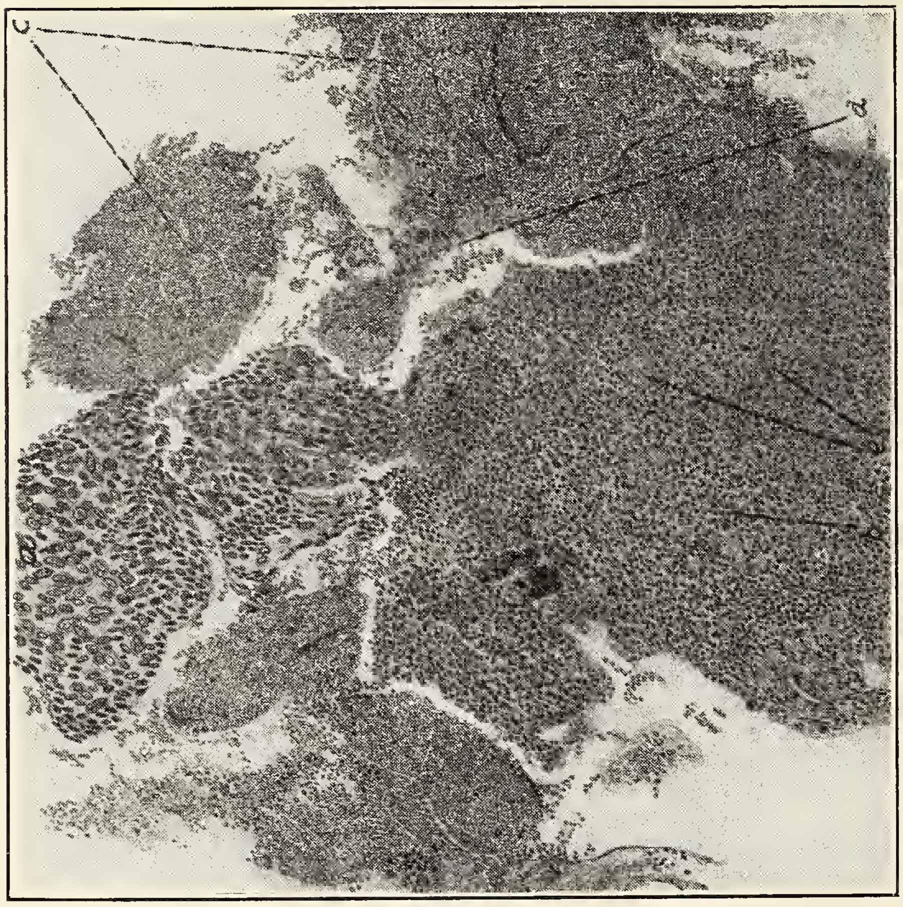


Fig. 1

Typical medullary cancer; *a,* masses of carcinoma tissue; *b,* lymphocytic infiltration, inclosing single carcinoma cells at e; *c,* represents hemorrhagic areas; *d,* a carcinoma cell nest.

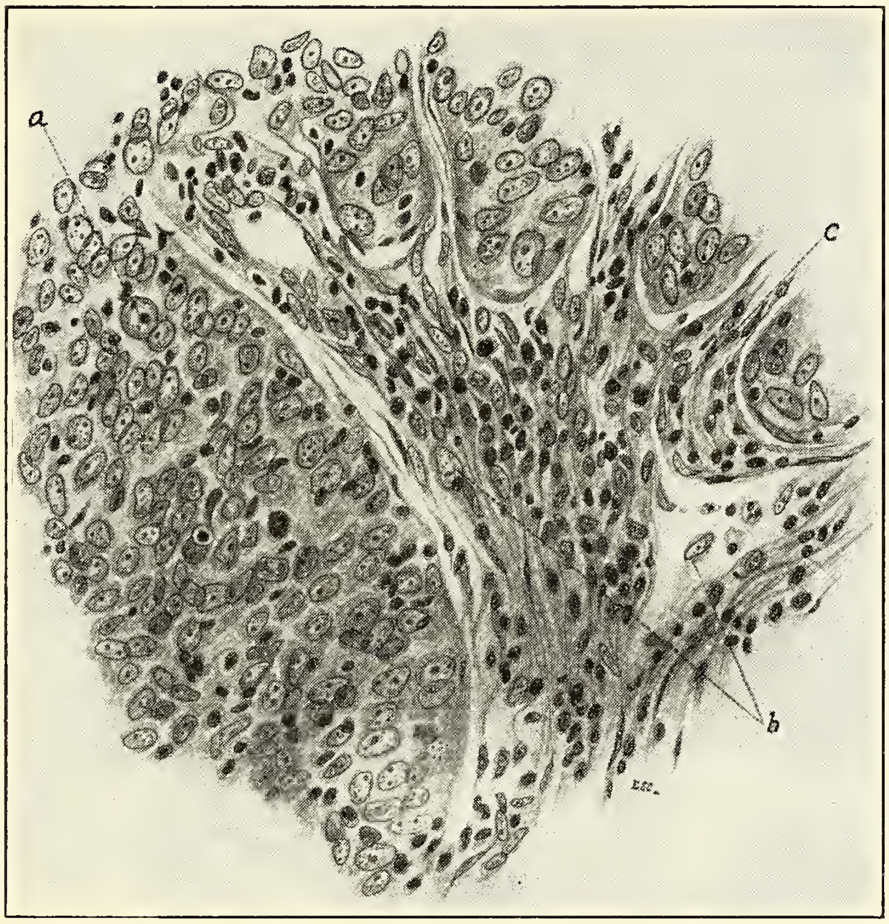


FIG. 2

Same growth as Fig. 1; *a*, homogeneous masses of large carcinoma cells; *b*, solitary large atypical epithelial cells in lymph vessels of original stroma; *c*, connective tissue now being replaced by atypical epithelial cell growth.

Fig. 3

a, Cells modified by vacuolization and granulation of the protoplasm and caryolysis of the cell nuclei; *b,* a giant cell; *c,* solitary carcinoma cells in lymph vessels; *d,* parenchyma containing young fibroblasts.

Ten days after radiumization with 2000 milligram hours.

Fig. 4

Enormous lymphocytic infiltration; *a,* blood vessels surrounded by muscle and connective tissue, c; *b,* horseshoe shaped mass of atypical cells; *d,* solitary necrobiotic carcinoma cells, surrounded by lymphocytes and connective tissue. Ten days after another application of 2000 milligram hours of radium

Fig. 5

High power magnification of portion of Fig. 4; *a,* cells with distinct cell wall; *b,* cell with hazy outline and horseshoe shaped nucleus without nucleolus; *c,* cells with vacuolization of the protoplasm, nuclei seen as fragments; *e,* remnants of cell nuclei, without other cell structures.

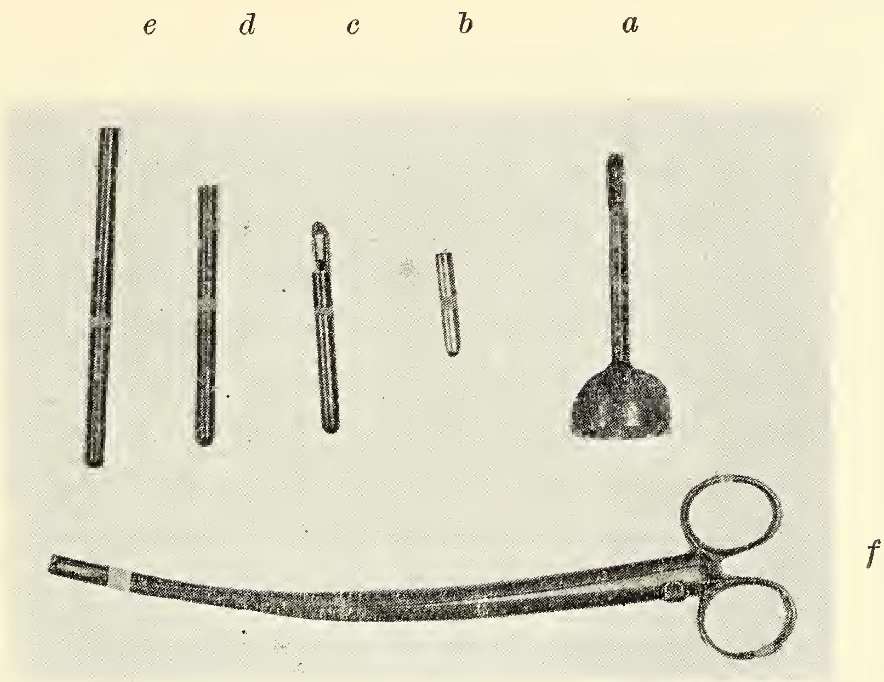


FIG. 6

a, Bomb; *b,* filter to hold 25 mg. radium element; *c,* 50 mg.; *d,* 75 mg.; and *e,* 100 mg. element; *f,* special forceps to facilitate insertion of capsules.

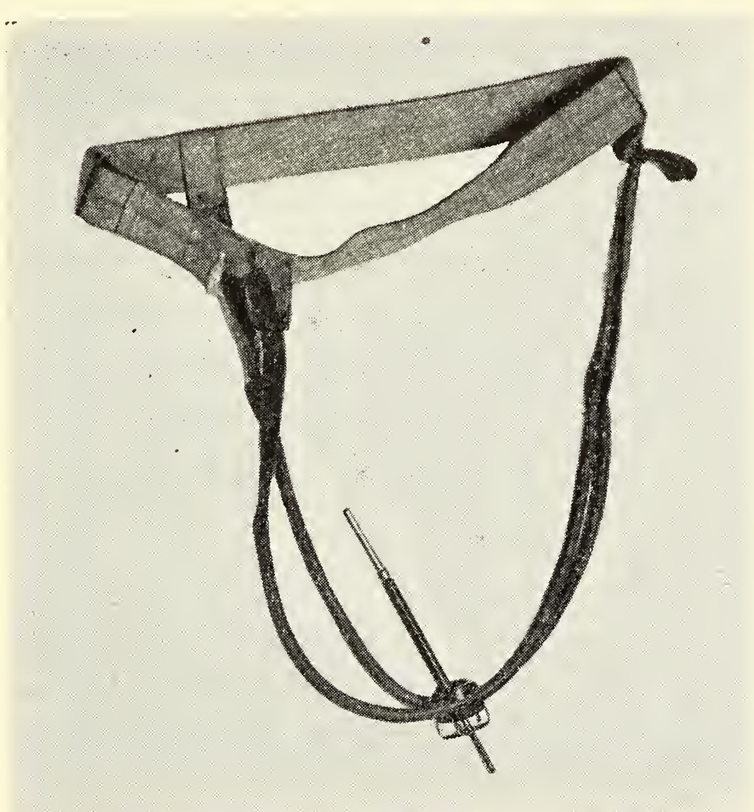


FIG. 7

Special belt to retain radium within lumen of rectum at any height desired.

Fig. 8

Shows method of using lead plating to make any kind of radium carriers for the oral and throat cavities.

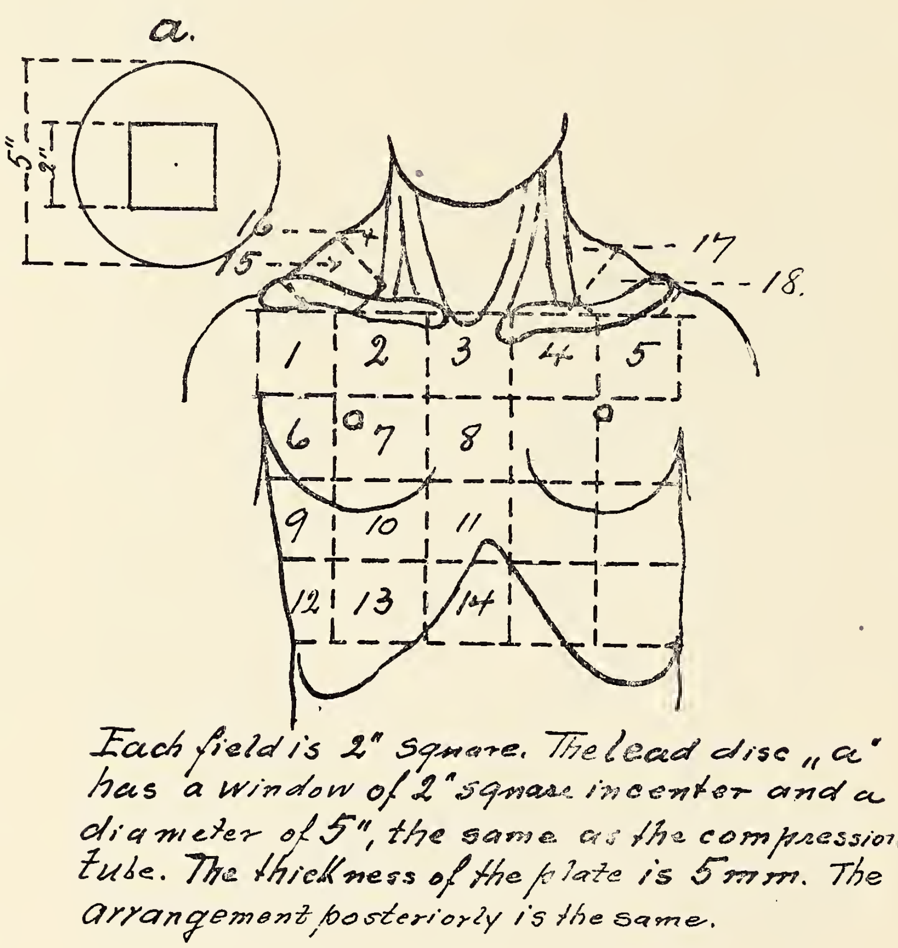


Fig. 9

Dotted lines indicate division of chest wall in roentgen treatment of carcinoma of the breast.

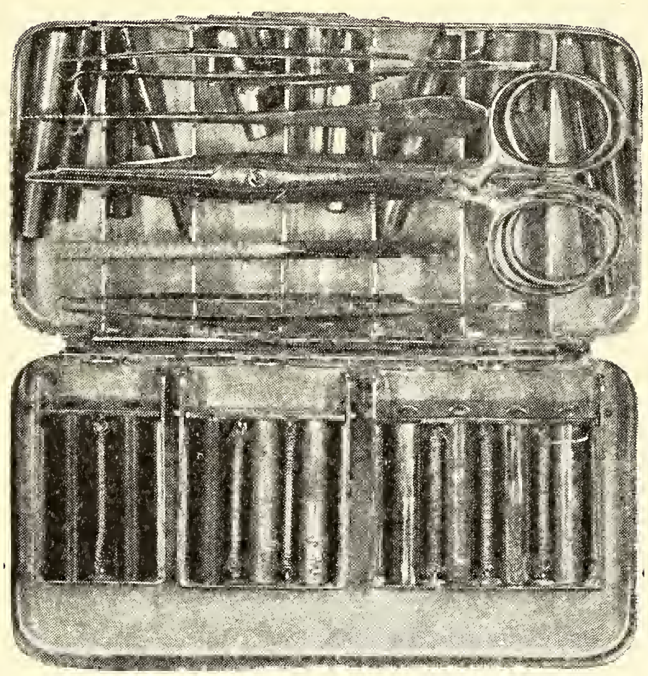


FIG. 10

Instrument case showing compactness of arrangement of filters and necessary tools.

25 EAST WASHINGTON STREET

THE OWNERSHIP OF THE ROENTGENOGRAM

I. S. Trostler, M. D.
Roentgenologist to St. Joseph's Hospital
Roentgenologist to Children's Memorial Hospital and American Hospital,
Chicago

During the last ten years there has been considerable discussion among roentgenologists in regard to the ownership of the roentgenograms or x-ray plates. A few roentgenologists have discussed the subject before general medical societies, and papers and editorials have appeared in a few of the general medical press; but up to this time, so far as I am able to learn, this subject has never been brought up before the Chicago Medical Society.

Practically all roentgenologists hold and contend that all roentgenograms, x-ray plates and other records of roentgen examinations belong to the roentgenologist, or to the laboratory or hospital where they were made, and I am glad to say that the great majority of general practitioners, surgeons and other specialists coincide with and agree to our views upon this subject.

It is especially to those who disagree with this contention and to those who have no opinion on the subject, that I wish to address this discussion.

Almost every day some one comes into one of my laboratories or calls me up on the telephone, asking for or demanding the plates that I had made during a roentgen examination. I invariably inform these people that I consider the plates to be my own private property; that these plates are a part of the records of the examinations, and as such belong to me. I am then told that Dr. X. or the Y. laboratory or the Z. hospital gives the plates to the patients, and I have to explain that because others part with their

records is no reason that I should break one of the hard and fast rules that have governed my actions for many years.

For over eleven years I have taken the position that all roentgenograms belong to the roentgenologist who makes them (or to the hospital or laboratory where they are made). I did this primarily for the protection of the physician who had referred the case to me. It is most important that a record of all findings should be carefully preserved of all cases in which he deems necessary that a roentgen examination be made.

When a patient is sent to a pathologist for examination of the blood or some other tissue, no demand is made for smears or other pathological specimens. No pathologist is expected to give anything more than a report of his findings, and his report is accepted as sufficient.

Then why expect anything more than a report from a roentgenologist? If the roentgenologist to whom you refer your patients is not sufficiently competent and reliable, so that his report is insufficient for you to place every confidence in; it is high time that you send the patients to one who is competent and prepared to render intelligent and reliable reports.

Roentgenologists, to be competent to render this service, must be graduates in medicine, as a knowledge of anatomy, physiology, pathology, surgery and other branches of medicine is absolutely essential to the correct interpretation of roentgen findings. The ability to make good roentgenograms is one of the least necessary qualifications and the ability to correctly interpret the roentgen findings is by far the most necessary.

Roentgen laboratories conducted by anyone but a recognized physician should not be countenanced, much less patronized by physicians who have the welfare of their patients and of the medical profession at heart.

In several instances it has been my good fortune to put an instantaneous quietus upon threatened damage suits, by

producing roentgenograms of fractures which showed the bones in good apposition; which in some manner or for some reason had later become dislodged and had malunited, giving a poor end result. Had I not kept possession of these roentgenograms there would have been nothing between the physician and a damage suit, which if not expensive from the financial aspect, would certainly be a damage to his reputation.

If for any good reason the referring physician deems it advisable or necessary, a paper print may be made from the roentgenogram, which will serve all the purposes of the original plate except as evidence before a court of justice.

Lawyers have threatened me with damage suits, mandamus proceedings and all sorts of more or less dire punishment, because I have insisted on retaining possession of what I have for years contended was my own property, and it seems to me that the time is ripe for some decisive action by the medical profession, to establish a definite rule regarding this matter.

If roentgenologists were merely picture makers—as, I am sorry to say a few physicians and many laymen consider us to be—there might be some basis for their demands for the delivery of the roentgenograms; but I for one will not admit that I am in the picture making business.

I contend—and do not believe that any one will deny—that the roentgenogram is a record of an examination, just as much as is the case record card that most of us make out and keep; and arguing from this standpoint I have been successful in bluffing out quite a number of more or less prominent attorneys. Some of these shook their fists under my nose, and threatened all sorts of things; but I have yet to give in to the first one or to be sued for the stand I take in this matter.

During the past year I have had in my possession for examination, roentgenograms from nearly every laboratory in Chicago, and from several hospitals. Many of these

were brought to me by the physicians in charge, but the plates in nearly every instance were brought to these physicians by the patients. This carrying of plates from one man to another has a decidedly bad effect upon the patient, who, knowing absolutely nothing about the interpretation of them, often asks the family physician about them. The physician may or may not know something about the plates, may give his opinion in entire good faith or possibly does it in preference to informing the patient that he knows nothing about it, and the result is, that much damage is done if the opinion differs from the one given to the referring man.

I have in several instances recently, had roentgenograms made by two or more roentgenologists, all of the same patient, proudly brought to me to compare with mine. In a few of these instances I have succeeded in inducing the patient to leave the whole lot with me. This was not done because I wanted the plates but was because I wanted to stop their shopping around, and it had the desired effect.

There have been decisions handed down by at least three state supreme courts—namely North Carolina, Virginia and Oklahoma—that roentgenograms or so-called x-ray plates may not be admitted as evidence unless the plates have been continuously in the possession of the person who made them; but our courts have become so lax in this regard that several times when I have been called as a witness and have produced plates, I have not been asked if I had made the plates myself, or if they were marked in any way so that I could identify them as the plates made of the individual whose case was on trial. Likewise, I have several times examined roentgenograms in court that had no mark of any kind, not even the name of the patient upon them, and these were admitted as evidence.

This feeling on the part of the attorneys, that the roentgenograms are common property, must come from the fact that their clients receive the plates as a matter of course.

To me it seems as though we were opening up a most dangerous line of conduct, which in time because of its frequent use will become a general usage, just as it is in real estate, when a path permitted to be used for a public passage becomes the property of the public after a certain length of time.

In looking up what has been said and written upon this subject, I find that practically every one who has discussed it contends that the plates or roentgenograms belong to the roentgenologist or the hospital where they were made.

In 1916 the French government forbade the delivery of roentgenograms to wounded soldiers.[1]

Albert Soiland, in the April, 1918, number of the *American Journal of Roentgenology* said, "In regard to the legal status of the roentgen plate, I believe that this belongs primarily to the roentgenologist."[2]

Norman C. Prince, in his hand book on Roentgen Technic, says, "Plates never should be allowed to leave the office permanently and not even temporarily unless it is well understood that they will be returned in a short time. They are the only absolute record that the roentgenologist has, and if lost sight of, he is greatly handicapped in various ways. X-ray plates are very frequently of great importance in legal matters. Instances may come up in which they will be of utmost importance, although little or nothing was considered at the time of the examination. They not only materially affect financial matters, but reputations, professional ability, false accusations, and numerous other things may in time rest wholly on the findings depicted in the roentgenogram."[3]

H. W. Van Allen, in the *Journal of the American Medical*

[1] Archiv d'elect. Med., Paris, 1916, XXVI, Supp., p. 64. Also Archiv de Med. et de Pharm., 1916, XV, No. 4.

[2] Soiland, Albert, American Jour. of Roentgenology, April, 1918.

[3] Prince, Norman C., Roentgen Technic, 1917, St. Louis, C. V. Mosby Co., p. 128.

Association in 1915 said, "The plate legally belongs to the hospital or to the roentgenologist—never to the patient".[4]

E. H. Skinner, discussing the Ownership of Roentgenograms in *The Modern Hospital,* said, "The patient and medical attendant are entitled to the Radiologist's opinion, but never to the plate".[5]

E. C. Samuel, discussing the Value of Roentgenograms in Medico-Legal Questions, in the *New Orleans Medical and Surgical Journal* in 1913 said, "The plate is the property of the roentgenologist".[6]

D. R. Bowen, in the *Journal of the American Medical Association,* in 1913 said, "The plate belongs to the radiologist."[7]

Albers Schönberg proposed at the 8th Congress of the German Röntgen Society in Berlin that the roentgenologist should be the sole owner of the plates. The society unanimously adopted resolutions that "All plates, diapositives, tracings, orthodiagrams and teleroentgenograms prepared for the diagnosis of the case are the property of the roentgenologist just as histological preparations belong to the pathologist".

In a paper by this same author, translated into English and published in the *Archives of the Roentgen Ray,* he said, "The roentgenologist is a medical specialist and all roentgen plates, prints, tracings and other documents which he may prepare are his sole property".[8]

George C. Johnston of Pittsburg (now Lieutenant Colonel

[4] Van Allen, H. W., The relation of the Roentgenologist to the Hospital, Jour. of the A. M. A., 1915, LXV, p. 1971.

[5] Skinner, E. H., Ownership of Roentgenograms, The Modern Hospital, 1913, pp. 1–68.

[6] Samuel, E. C., The Value of Roentgenograms in Medico-Legal Questions, New Orleans Medical and Surgical Journal, 1913, LXV, No. 12.

[7] Bowen, D. R., Jour. A. M. A., 1913, LXI, p. 1485.

[8] Schönberg, Albers, Verhandlung die Deutsche Röntgenologische Gesellschaft, Berlin, 1912, VIII; same, Archives of the Roentgen Ray, London, 1912–1913, XVII, pp. 94–97.

in charge of the X-ray Division of the U. S. Army), in the *Pennsylvania Medical Journal* in 1908, said, "It is customary among good radiographers to tell the patients that they make diagnoses, not pictures, and to refuse wherever possible to give either plates or prints made from them to the patients".[9]

G. H. Stover, in the *American Quarterly of Roentgenology,* in 1911 said, "The skiagram is a part of the Roentgenologist's record of his study of the patient's case".[10]

Chas. A. Pfender, in *Washington Medical Annals,* in 1916 said, "All roentgen plates, prints, tracings and other documents which he may prepare are his sole property and merely a means towards aiding him in arriving at a diagnosis. The original plate should be kept together with the record of the case for future reference".[11]

The *Journal of the American Medical Association* in 1916, in reply to a query, said, in part, "It may be true that the patient cannot demand and obtain possession of the plate".[12]

At the mid-summer meeting of the American Roentgen Ray Society in 1914, a committee composed of five of the leading American roentgenologists brought in a report to the effect "That no report should be given to the patient except through the referring physician or surgeon.

"That patients are sent for consultation and diagnosis and are not entitled to plates or prints. Prints in the hands of patients lead to false interpretation, confusing opinions, multiplicity of advice and bad results".[13]

[9] Johnston, George C., Medico-Legal Status of the Roentgen Ray, Pennsylvania Medical Journal, 1908, p. 844.

[10] Stover, G. H., The Radiographer's Property Right in the Radiogram, American Quarterly of Roentgenology, 1911–1912, III, p. 131.

[11] Pfender, Chas. A., The Roentgenologist as a Consultant; His Rights, Privileges and Responsibilities, Washington Medical Annals, 1916, XV, p. 41.

[12] Jour. of the A. M. A., 1916, LXVI, p. 1650.

[13] American Journal of Roentgenology, December, 1914, p. 563.

Numerous other authors and essayists could be quoted, all of whom contend that the plates or roentgenograms that we make in the course of our examinations are and of right ought to be our own property and I want to urge all roentgenologists to insist upon this.

Those of you who refer cases for roentgen examination should insist that the roentgenologist keep possession of all plates and other records.

[14] Jour. of the A. M. A., 1916, LXVI, p. 982.

[15] Same, 1916, LXVI, p. 2117.

[16] Same, 1917, LXVIII, p. 1433.

[17] Same, 1915, LXV, p. 355.

[18] Same, 1912, LVIII, p. 1700.

[19] Beclére, Du rôle du medicin radiologiste en medicine legale, Societe de medicin legale de France, Bulletin, Paris, 1911, VIII, pp. 45–57.

[20] Mason, R. D., The Medico-Legal Aspect of the Roentgen Ray from the Standpoint of the Surgeon, American Journal of Surgery, New York, 1911, XXV, pp. 53–56.

Discussion

Dr. A. F. Tyler, Omaha, Nebraska: About two years ago there was a decision handed down by one of the judges in the State of Kansas on this very question of the ownership of roentgenograms. This judge expressed the opinion that a radiographic plate is a part of the record of the examination and really belongs to the man who is making the examination rather than to the patient.

615 Garfield Ave.

THE EARLY HISTORY OF X-RAY IN CHICAGO

J. Holinger, M. D.
Ear, Nose and Throat Surgeon for St. Joseph's, Alexian Brothers, Grant, St. Elizabeth's, and Cook County Hospitals, Chicago

Dr. Trostler called my attention to the fact that little is known about the first experimental work with x-rays in Chicago. Having lived on terms of close acquaintance with all the gentlemen who were the first to become interested in that work, I tried to gather whatever facts I could. It soon became evident that a great many valuable data were irretrievably lost through the death last May of Dr. C. F. Harnisch, and through the destruction of his papers. Important facts are only very hazily known even to those concerned. On the other hand there is evidence that the men who started this work were high minded idealists. In trying to make the benefits of the new invention accessible to the suffering public of this city and of this country they underwent the hard work and privations of the pioneer life. Intermingled with success and disappointment were tragicomical effects. The hardest blow to the new science was a law suit, the startling features of which might be enough to discourage all but the most hardy and persevering.

Here are the facts as I gathered them from Dr. Harnisch himself, Mrs. Harnisch, Dr. O. L. Schmidt, Dr. P. Latz, and others.

Dr. Harnisch, an ophthalmologist in Chicago, became interested in x-ray soon after the first publications appeared and started to correspond with Prof. Roentgen. Dr. Harnisch had very extensive theoretical knowledge of electricity and photography, but little practical experience. None

of the necessary apparatus was on the market and substitutions were impossible, so practically everything was lacking. The parlor of his private apartment became the laboratory, and Mrs. Harnisch has not forgotten to this day that these men ruined her carpets and her furniture. There being no street current available in his vicinity, a battery of ordinary cells had to be built. No one knew at that time or cared to know anything about an electric spark that was able to jump a gap of three or five inches. And more was necessary. Dr. Harnisch studied up the matter. He ordered apparatus, especially Crooke's tubes, from Europe. Some tubes were made here in Chicago by Mr. W. J. Boehm in 1896. After a long search Dr. Harnisch found an induction coil at McIntosh Battery Co. in Chicago which gave him a spark of six inches. At the end of January or beginning of February, 1896, he started experimenting. For an interrupter he tried the common magnet and anchor device. It did not work well and proved to be one of the most difficult problems. The interrupter question was not definitely solved till several years later. The magnet remained magnetic, the anchor stuck and therefore the spark was irregular. In consequence the dry plates could not be used, as they were too sensitive and always overexposed. Wet plates were made. Dr. Latz up to that time had done the chemical work.

The financial resources were limited, as may well be imagined, since Dr. Harnisch had been in practice but a very short time. But still the work went on and many good plates were made, the first successful one being of the hand of Mrs. Harnisch, showing the bones and the wedding ring clearly. The question of reducing the overexposed plates by means of ferrocyanide of potassium came up. This forced Dr. Latz to withdraw since he was sensitive to cyanide on account of former poisoning from it.

About the end of April, 1896, the laboratory was moved downtown and an electrician was put in charge. This ar-

rangement simplified matters as a street current could be used. Still it was not satisfactory. In June finally Dr. O. L. Schmidt who had shown great interest in the work from the start took over the whole laboratory and put it in the hands of Mr. W. C. Fuchs, a man of experience as a practical electrician and photographer. Mr. Fuchs as many of you know died since then of x-ray carcinoma. By that time more about x-ray was known and more suitable apparatus could be had. But still nothing was known of injuries or x-ray burns. The tubes, mostly Crooke's tubes, were very imperfect and therefore patients often had to be exposed for twenty minutes, half an hour, or longer. Why not, no harm could come from it, was the general conviction. By that time several articles on the diagnostic value of x-ray had appeared in the daily papers. The people began to take notice.

It was in September, 1896, that a lumber dealer from Blue Island came into Mr. Fuchs' laboratory and asked to have a picture of his foot taken. He had hurt his foot nearly a year before. The man was under the influence of liquor, "stewed" as Mr. Fuchs said, from whom I have these facts. The plate showed some irregularity, but the man had moved and a better plate was to be made. It was the same. The man sent for some more whisky in order to steady himself, despite the objections of Mr. Fuchs. He became worse. After a third plate was taken the man went home in a very happy frame of mind. An accurate diagnosis could not be made from the plate. There was suspicion of tubercular trouble in one of the tarsal bones. The following abstract of the case appears in Kassabian's book, from the *American X-ray Journal,* May, 1899:

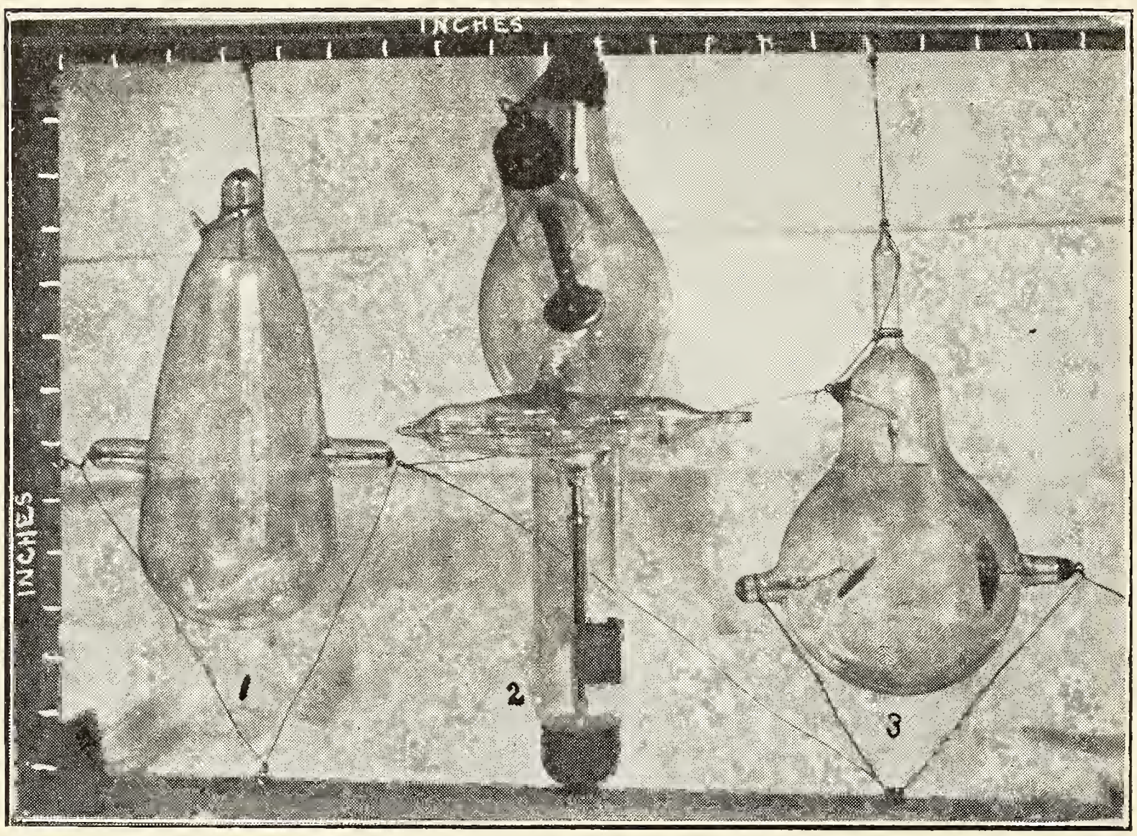
"In the United States a suit was brought for $25,000 damages against Dr. Otto Smith and Prof. W. C. Fuchs of Chicago (*American X-ray Journal,* St. Louis, Mo., May, 1899, No. 5, page 566). The plaintiff, aged 37, broke his right ankle as a result of an accident on Sept. 2, 1895. He

was able to attend his business on May 1, 1896, and was then practically as well as ever. He only suffered from slight stiffness and occasional swelling in the ankle. On Sept. 19, 1896, x-ray plates were made, each sitting occupying from thirty-five to forty minutes, the tube being placed five or six inches from the ankle. While under the exposure the patient complained of sharp tingling pains. Three days after, a slight redness appeared between the big toe and the adjoining one, which in three weeks had spread over almost the entire dorsum of the foot, later forming a blister. An intensely painful ulcer formed, for which condition amputation of the foot was performed. The jury awarded the plaintiff a verdict for $10,000."

This presentation gives only one side. The *X-ray Journal* does not give the other side. Here it is. Dr. Schmidt never saw the man. At the time the plate was made nothing was known about x-ray burns, on the contrary, every new publication emphasized the perfect harmlessness. It was not till several months later that the first news of injuries caused by x-ray burns came to this country. Of course no insurance existed or was taken out against malpractice suits. Why? As long as the procedure was thought to be absolutely harmless.

The whole litigation took several years. Dr. Schmidt, a most conscientious man, suffered terribly from the impertinent insinuations the lawyers made. On the other hand they had easy sailing, because every month brought new evidence of burns in their favor. The slow recovery from the primary injury, the repeated reamputations, the showing of the plate make it probable that a tubercular process was present, and it seems to me that the rest of the case was a frameup from the fact that Dr. Schmidt was never notified or had a chance to see the specimen or the patient. This suit put Mr. Fuchs nearly out of business, but Dr. Schmidt again kept him above water. I saw many of his plates, and some were as good as the best of nowadays.

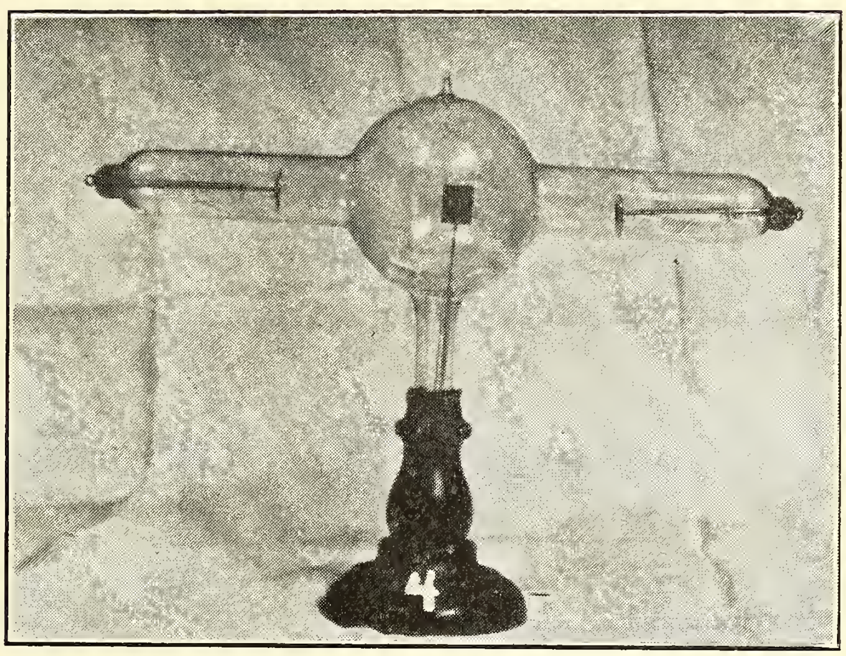
Let me repeat: Dr. Harnisch took pictures as early as January or February, 1896. June, 1896, Mr. Fuchs became interested, and many of you knew him. Dr. O. L. Schmidt was, from the first, the financial backer, adviser and patron.



TUBE NO. 1. Made by W. J. Boehm, in Chicago, early in 1896. Probably the first Roentgen Ray tube made in the United States.

TUBE NO. 2. Made by Heinz Bauer and brought to this country early in 1896. Probably the first Roentgen Ray tube in this country with vacuum control.

TUBE NO. 3. Made by Gundelach in 1895 and brought to this country early in 1896.

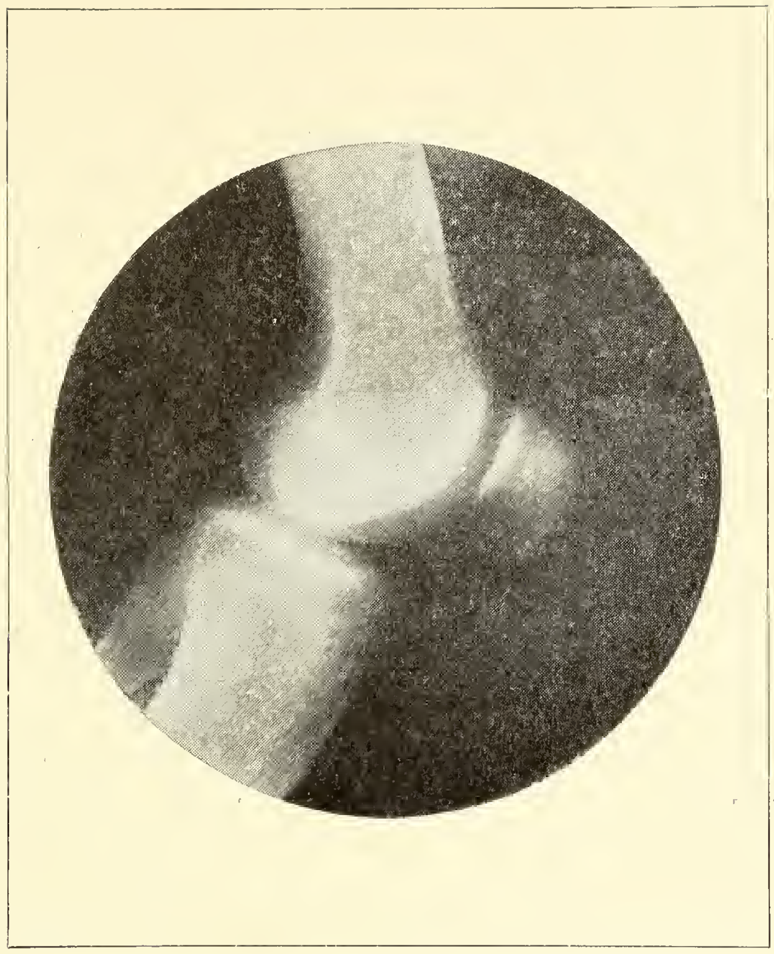


TUBE No. 4. Made by the Algemeine Electricitats Gesellschaft in 1895 and brought to this country in 1896. This is the first tube to take on the outward form of the modern gas tube.

THE USE OF THE PLATE SHIELD AS A CHECK IN DARK ROOM WORK

The plate shield consists of a rectangular sheet of lead from 1-16 to 1-8 of an inch thick, 8⅛ inches wide by 10⅛ inches long, with a circular hole cut in the center 7 inches in diameter. This size shield is intended to be used with 8x10 plates and the advantage of having it ⅛ inch larger will be at once apparent when using it with plates loaded in either envelopes or cassettes. The purpose of the shield is to provide a simple, easy and frequent check upon the condition of the plates and developing and fixing solutions that are being used.

If a plate, in good condition, be removed from the original package and carried through the developing process with the solutions in prime condition and at the proper temperature, the emulsion will be quite transparent, in fact almost as transparent as the glass itself. If the plate had been exposed to ordinary light or x-ray light, the emulsion would develop out black, or dark, in degree, to the extent of such exposure to light, any defect in the film would be at once noticeable. Plates developed and fixed in old solutions or at too high temperatures would show more or less stain, generally of a yellowish or brown color. The waste of plates used in this way may be avoided by the use of the plate shield. By placing the shield over the loaded plate only the 7-inch opening is exposed. This opening provides sufficient area for most extremity work and for certain other regions when working on those regions in detail. The outer border of the plate, covered by the shield, should always develop out clear and transparent. Any previous exposure the plate may have had, any waves, streaks, spots or lines due to faulty plates would be seen at once. Any chemical fog or stain would also appear. Any light or chemical fog or stain that appears upon this outer border will interfere, to the same extent, with the quality of the area exposed.



Roentgenogram Made with Plate Shield

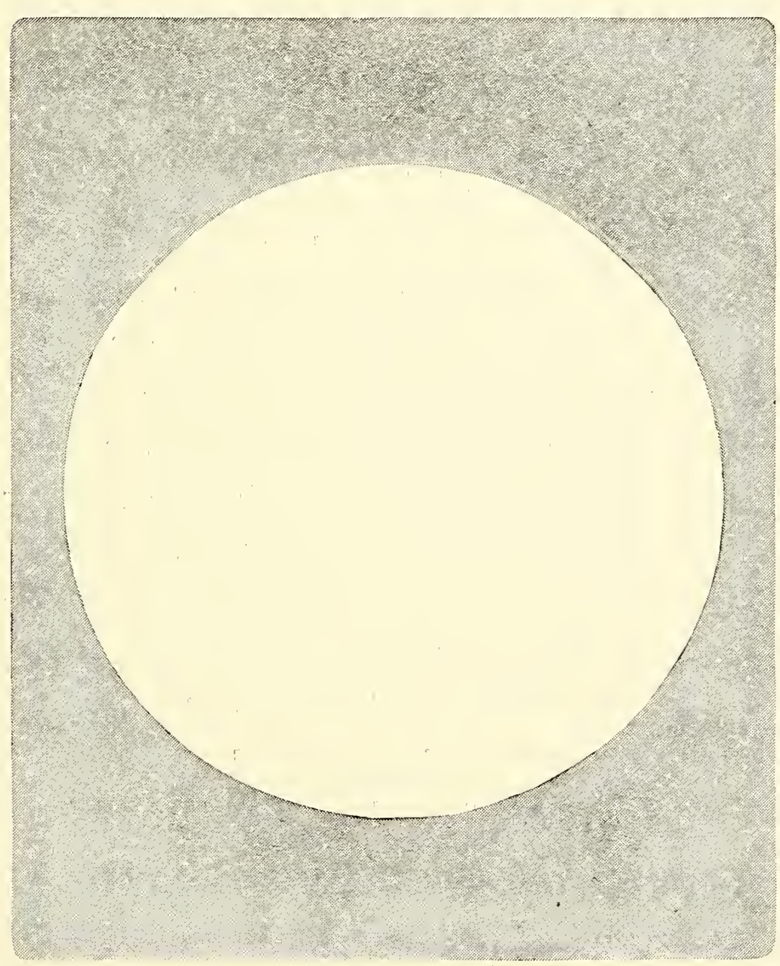


Plate Shield

It requires a considerable experience and skill to detect many of the emulsion defects and light or chemical fog when the entire surface of the plate has been exposed. You learn quickly and look for this clear transparent border and when it does not appear you at once proceed to locate the cause of the trouble and get it out of the way.

It is not intended that the shield should be used with all plates. Occasionally the entire surface of the plate is needed for the area to be exposed. It should be used frequently however and if so used will materially advance the standard of your work.

The lead shield may be reinforced with a piece of sheet steel on each side of the lead as this prevents the shield bending so easily.

The use of the plate shield demands greater care in the placing of the patient in position and consequently encourages greater uniformity of positions and angles.

Ed. C. J.

RULE AS TO PRIVILEGED COMMUNICATIONS APPLIED TO ROENTGENOLOGIST

Journal of American Medical Association, Volume 71, No. 24, Dec. 14, 1918, Page 2019

(Shaw *v.* City of Nampa (Idaho), 171 Pac. R. 1132.)

The Supreme Court of Idaho applies the rule as to privileged communications to a roentgenologist, in this personal injury case, under the following circumstances, as stated by the court: When the plaintiff was injured, she employed a physician who immediately took her to another town, where he employed a physician to take a roentgen-ray picture of her broken arm. After the picture was taken and developed, the second physician or roentgenologist consulted with the first or plaintiff's regular physician relative to the interpretation of the picture and the treatment to be administered. Counsel for the plaintiff objected to the

roentgenologist's testifying as to any facts learned while he was thus employed, which objection the supreme court holds was properly sustained. It appeared from the evidence, the court goes on to say, that the roentgenologist did more than perform mere mechanical work as a photographer, and that he used his knowledge and experience as a physician in interpreting the meaning of the picture, and advised with the plaintiff's regular physician as to what treatment should be given, the plaintiff paying the roentgenologist for his services. The trial court was justified in excluding such evidence as privileged communication, under the Revised Codes of Idaho, Section 5958, Paragraph 4.

BOOK REVIEW

United States Army X-Ray Manual. Prepared under the direction of the Division of Roentgenology. Authorized by the Surgeon General of the Army. Paul B. Hoeber, 67–69 East Fifty-ninth Street, New York, October, 1918. $4.00.

The contents of the above publication cover the fundamentals of practically the entire field of Roentgenology.

X-ray physics is materially simplified, and very thoroughly presented.

The use, abuse and care of the gas containing and Coolidge tube, as well as the entire electrical Roentgen equipment, is very ably covered.

Dark room technique is considered from the various angles, showing the care in handling of plates, chemicals, intensifying screens, lights, the filing of negatives, etc.

The discussion of new apparatus is very interesting and instructive.

Localization, of course, is especially well illustrated. Roentgen localization in army practice is very essential, and as essential in certain civil practices. Roentgen departments, having a limited number of foreign body cases

referred for localization, will find the treatise on this subject, alone, worth the price of the publication.

The article relating to sinuses and mastoids is very well written, but will state that my experience, in frontal sinus roentgenograms, has proven more satisfactory, if the patient's nose does not come nearer than one-half inch of the plate, which will cast the shadow of the petrous portion of the temporal bone in the orbit, showing the frontal sinuses and antra practically normal.

The mastoid technique may be materially improved—viz., patient prone, lying on abdomen. In this position the patient's head may be rotated from left to right and vice versa, obviating the necessity of the patient turning the body, and makes fixation more satisfactory. Plates are made with the head on a 23 degree angle, tube parallel with the table, stereoscoping the right and left mastoid on a single pair of 8x10 plates, by covering half of the plates, as stated by the author.

Thoracic viscera is very timely and properly considered, excepting the statement of dispensing with stereoscopy of the lung plates.

> ''Stereoscopy can, however, usually be dispensed with, as the data it furnishes does not materially differ in character from that found in a good single plate.'' P. 369.

The technique pertaining to the examination of the urinary tract is complete, considering patient preparations, positions, pyelography, etc., for the production of plates for diagnosis.

The gastro-intestinal tract and Roentgenotherapy are very practically considered.

This Manual covers a very extensive field, being quite compact. The writer wishes to recommend the United States X-ray Manual as being equally invaluable to Roentgenologists, technicians and manipulators. B. A.

Abstracts

ABSTRACT FROM A MANUAL OF ROENTGENOLOGICAL EXAMINATION OF THE CHEST

American Review of Tuberculosis, Volume 2, No. 9, November, 1918, Page 551

Kennon Dunham
Cincinnati, Ohio

The author gives a description of the varying densities seen in Roentgenograms of the chest and mentions the anatomical and pathological structures which are the etiological factors. In part, his conclusions are drawn from twenty-six lungs, showing abnormal densities in Roentgenograms from which blocks were cut and examined histologically, to determine the cellular pathology, causing these densities. He emphasizes the fact that his descriptions are of plates taken by a definite technique and would not correspond to the picture given by a different technique. The description of any plate or fluoroscopic picture when a given technique is used, he calls the ''norm''. He emphasizes the need for standardization of technique in order that the ''norm'' may be standardized.

He first outlines the fluoroscopic method: It is essential that the operator should previously stay in the dark until his eyes are rested and the pupils dilated, so that he may utilize a soft ray, which will just penetrate the thorax. A bright light from a harder ray should only be used at the end of the examination to judge the density of any abnormal shadows.

Three fields are to be examined; that to the right and that to the left of the heart and the ''median strip'' between the

heart and the spine. The first two should be the same on the two sides except at the hilus, the trunks of which are obscured by the heart on the left side. The apices are normally darker than the rest of the lung and light up after cough. Dark shadows of calcifications are frequently seen in the hilus and lung field in healthy individuals.

An oblique angle is used for the ''median strip'', which contains the trachea and esophagus. On inspiration, a bright triangle should appear between the heart, spine and diaphragm. There should also be another light area higher up between the aorta and spine.

The extent of the diaphragm excursion is a little greater on the left side with forced breathing. The excursion is greatest in tall slender people and anything under five centimeters on either side is abnormal. Irregularities of the dome should be noted and accounted for. Varying angles should be used to determine diaphragmatic adhesions.

In emphysema the lightness of the lung fields does not change with inspiration and expiration, and the diaphragm excursion is limited while the chest wall is seen to heave. The right and left domes are flattened and the phreno-costal angle is obtuse. The dropped heart is usual.

The line above pleural exudate is concave, and does not shift with change of position, while that above the pleural effusion with lung tumor is convex, and shifts with change of position. The line above hydropneumothorax is horizontal, and shifts freely, while that above a transadate shifts slowly.

Stereoscopic plates are necessary to detect the slight acute lesions of pulmonary tuberculosis, but if the areas above the clavicles do not light up after cough, a lesion of increased density should be diagnosed, and pulmonary tuberculosis suspected. Pericardial and diaphragmatic adhesions and pleural effusion make one suspect tuberculosis. The diagnosis of pulmonary tuberculosis should

never be made in an adult from abnormally heavy hilum and trunk shadows.

He next outlines the stereoscopic method: The shortest exposure giving good detail is best. Longer exposures produce fuzzing of the linear markings because of the quivering of the lung caused by the heart beats. Six seconds is the maximum time that should be used from the beginning of the first exposure to the end of the second. The exposures should be made with lungs moderately filled and breathing should not be allowed between exposures. A comparatively hard tube, 70 K. V. or 6½ inch spark gap, should be used.

A sitting posture is best with the chin raised and turned to the left and the arms dropped with the elbows out. The plate should be placed in front of the patient. The target must be twenty-five inches or more from the plate and the principal ray of the first exposure should pass through the spine at the fifth dorsal vertebra. The principal ray of the second exposure should pass through the spine six or seven centimeters below the first.

The reading of the stereoscopic plates consists of: first, the objective description, and second, the subjective deduction. He describes (1) Plates, (2) Bones, (3) Muscles, (4) Trachea, "the most important landmark on an x-ray plate is where the left bronchus passes under the arch of the aorta", (5) The hilum, (6) The right thorax, which he divides into (a) upper division, (b) middle division, and (c) the lower division. Three trunks go to the upper division. (The density of the trunks is caused by the bronchus, artery, vein, lymphatic and connective tissue). The first trunk, called the vertebral trunk, runs parallel to the vertebral column, and divides behind the clavicle into linear markings which normally do not reach the periphery. These linear markings are circumscribed by the first rib. The second trunk lies behind the first interspace and its linear markings extend out behind the first and second ribs.

The third trunk extends from the hilum to the second interspace and sends linear markings to the second and third interspaces. It is the largest trunk of the upper division. The trunk of the middle division is not always seen in the normal chest. It comes off the main bronchus to the lower lobe and is a considerable distance from the third trunk of the upper division. It divides into anterior and posterior divisions, a short distance from the main stem. The trunks to the lower or posterior division are inconstant and matted together except the apical trunk of the lower lobe, which passes posteriorly from the main stem bronchus on a level with or a little above the middle division bronchus. One branch passes up and back, while another passes laterally, and slightly down. (7) The left thorax has only two divisions. In place of the mid-lobe trunk, we have the long lingual tip trunk given off the upper lobe bronchus which passes to the anterior part of the chest, and is usually seen in diseases of the heart.

The characteristic tuberculosis plate marking consists of a fan shaped density with the base of the triangle toward or near the pleura, and the apex toward the hilum and connected to it by a heavy trunk. If we have two or more such areas of differing densities the picture is pathognomonic of tuberculosis, because tuberculosis is a disease of successive infections. The greatest density indicates the oldest lesion. The radiating linear markings may either be interwoven, broadened, studded, obscured by a filmy cloud effect, mottled, matted together or entirely blotted out. "The striking characteristic of tuberculosis is the varying degree of change in the trunk groups, in contrast to the general homogeneous change in diseases which might simulate tuberculosis and the lack of continuity with which the trunks may be involved." Early or slight lesions in adults are usually limited to the trunks of the upper lobes. If the linear markings of a given trunk are fuzzy or are faintly obscured by a cloud effect and the fan appears wide open, active

tuberculosis is suggested. If the linear markings are clean cut and dense and clean cut studdings show beyond the trunks and the fan is partly closed, a healed lesion is suggested.

In miliary tuberculosis the lung fields are studded with fine dots of increased density which vary from the faintest cloud to the brilliant spots of calcification. Anthracosis simulates the calcified variety of miliary tuberculosis but the dots are more stellate. Carcinoma sometimes simulates uncalcified tubercles.

Caseous bronchopneumonia gives a definite heavy flocculent density, usually in the dependent parts. The fan may or may not be in evidence. With a small lesion near the periphery, it will be walled off by heavy septa, and the flocculent lesion will appear just beyond a trunk of increased density. Then it will have the triangular shape of the fan, but the sticks will not be in evidence. With large lesions, it is often impossible to make out the individual triangles.

With brown induration the density is usually more diffuse, and the trunk of the lingual tip is abnormally prominent and zig-zag.

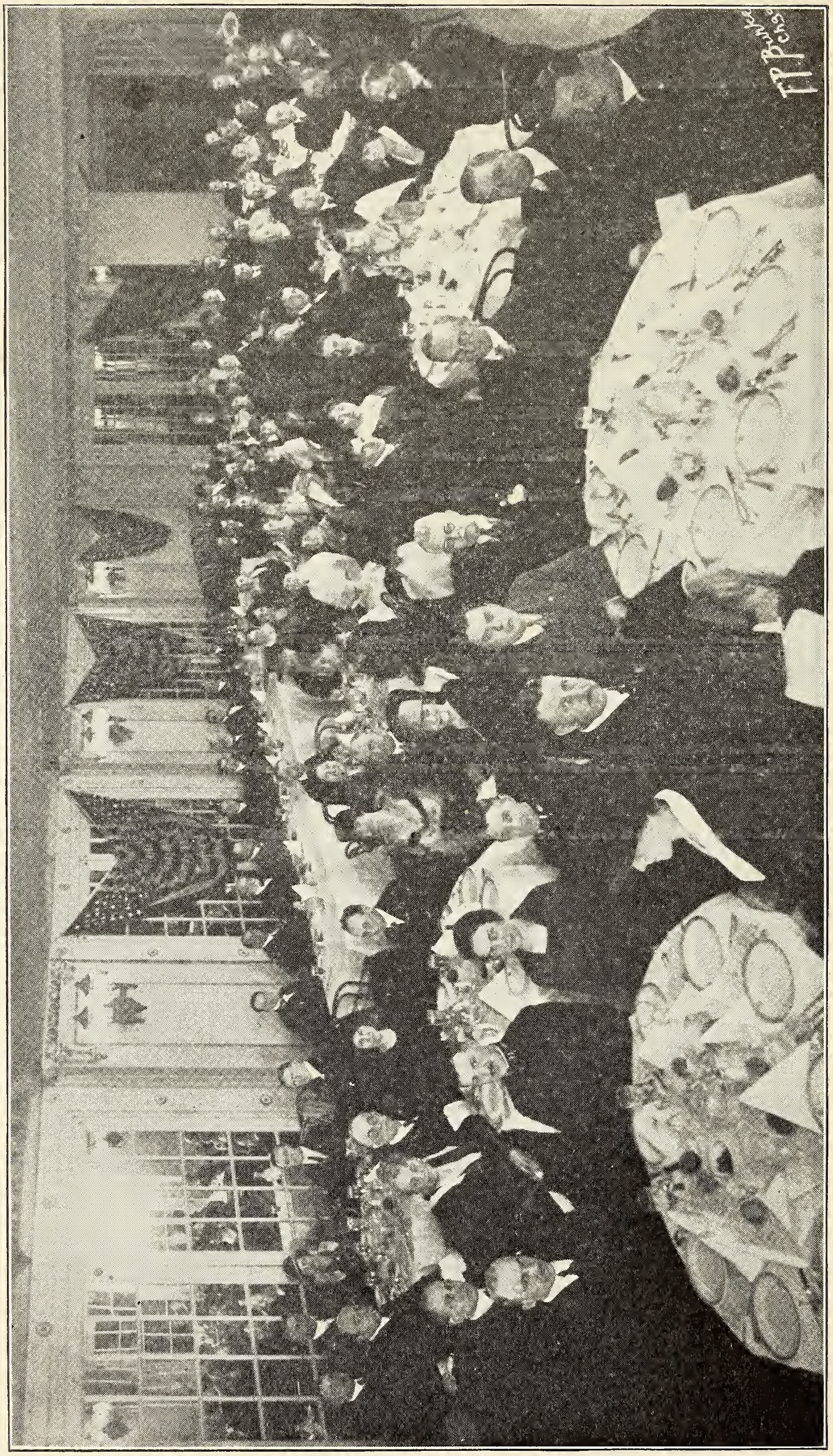
Simple catarrhal conditions such as grippe and bronchitis produce no abnormal densities unless the exudate extends into the air sacs.

Syphilis of the lung gives no recognizable x-ray picture, except the stellate scars of old tertiary lesions.

Pleural effusion, emphysema and hydro-pneumothorax are the same in the fluoroscopic picture and the localization of foreign bodies in the lung is similar to such procedure for other parts of the body.

By histological examination, he proved that calcification causes the greatest density of all pulmonary lesions, caseation following second, with fibrosis a close third. Cellular exudates are more dense than serous.

C. G. F.



Dinner Fourth Annual Meeting Western Roentgen Society

FOURTH ANNUAL MEETING OF THE WESTERN ROENTGEN SOCIETY

The Western Roentgen Society held the fourth annual meeting at Hotel Sherman, Chicago, November 20, 21, 22, 1918.

In spite of the existing conditions just preceding the meeting, the Society enjoyed the most instructive meeting and was favored with the largest attendance since the organization was founded.

The Chicago Medical Society extended the courtesy of a joint meeting, as shown by the following program:

OFFICIAL PROGRAMME

Fourth Annual Meeting, Western Roentgen Society
Headquarters: Sherman House, Chicago

November 20, 21, 22, 1918

PROGRAMME

Wednesday Morning Session, November 20th

1. Call to order, 10:30 o'clock.
2. Reading of minutes.
3. Reports of committees.
4. Appointment of committees.
5. Unfinished business.
6. Announcement of new members.
7. New business.
8. General announcement.

Adjournment not later than 12:30 noon.

Wednesday Evening Session

Joint Meeting with the Chicago Medical Society at 8:00 P. M.
Marshall Field Annex Building

1. Essential Principles of Deep Roentgen Therapy.
A. F. Tyler, M. D., Omaha, Neb.
Discussion by Henry Schmitz, W. A. Pusey, Frank R. Simpson, and C. W. Hanford.

2. Chest Inconsistencies.
   Alden Williams, M. D., Grand Rapids, Mich.
   Discussion by Frank Smithies and William J. Butler.

3. Cinematographic Case Report.
   R. L. Smith, M. D., Lincoln, Neb.

4. Ownership of Roentgenograms.
   Dr. I. S. Trostler, Chicago, Ill.
   Discussion by Fred C. Zappfe.

Thursday Morning Session, 10:00 A. M.

1. Some Observations on Hydrogen Tube Technique.
   E. O. Liston, M. D., Lincoln, Neb.
   Discussion by M. B. Titterington.

2. Certain Causes for Rejection in Draftees Appearing before the Cleveland Medical Board, with lantern slide illustration.
   W. I. LeFevre, M. D., Cleveland, Ohio.
   Discussion by M. J. Sandborn.

3. Roentgen Organization in America.
   Fred C. Zappfe, M. D., Chicago, Ill.

4. Cancer Problems in Moving Pictures.
   J. M. Martin, M. D., Dallas, Texas.

5. Early History of Roentgenology in Chicago.
   Jacques Hollinger, M. D., Chicago.

6. Bone Growth and Regeneration.
   A. M. Peterson, Chicago, Ill.

Adjournment not later than 12:30.

Thursday Afternoon Session

1. President's Address.

2. Some Observations in Roentgenology of the Chest.
   W. Walton Wasson, M. D., Denver, Colorado.
   Discussion by Max Biesenthal.

3. A Resume of work in conjunction with Advisory Board.
   M. J. Sandbourn, M. D., Appleton, Wis.

4. Filing, recording and indexing Roentgenograms and Roentgenographic Library.
WILL ULTES, M. D., Springfield, Ohio.

5. Roentgen Diagnosis of Pathology in the Duodenum.
ROBERT L. FRENCH, M. D.
Discussion by O. H. MCCANDLESS.

6. A Pigmented Mole Showing the Roentgen Ray Shadows of a Renal Calculus.
NATHANIEL G. ALCOCK, M. D., Iowa City, Iowa.
Discussion by W. S. LAWRENCE.

7. Enlargement of the Heart.
A. W. CRANE, Kalamazoo, Mich.
Discussion by HOLLIS E. POTTER.

Adjournment not later than 5:30.

Thursday Evening

Dinner and Welcome to

LT. COL. GEO. C. JOHNSON, Chief X-ray Division, U. S. A.
Washington, D. C.

LT. COL. WILLIS F. MANGES, Director
Camp Greenleaf School of Roentgenology
Chickamauga Park, Ga.

1.	Social Hour . . .	6 P. M.
2.	Dinner	7 P. M.
3.	Speaking	8 P. M.
4.	Entertainment . .	9 P. M.
5.	Dancing and Music .	10 P. M.

Friday Morning Session, 10:00 A. M.

1. Filling Defects of the Alimentary Canal Due to Extra-alimentary Causes.
M. J. HUBENY, M. D., Chicago, Ill.
Discussion by WILLIAM ENGLEBACH.

2. Clinical and Roentgen Evidence of Cardiospasm with Acute Dilatation of the Oesophagus.
FRANK SMITHIES, Chicago, Ill.
Discussion by C. H. BALLARD, M. D.

3. The Value of Roentgen and Radium Treatment in 600 Cases with Various Pathological Conditions.
   HENRY SCHMITZ, M. D., Chicago, Ill.
   Discussion by G. B. BROWNE.

4. Roentgen Diagnosis in Relation to Clinical Team Work.
   V. L. SCHRAGER, M. D., Chicago, Ill.
   Discussion by PAUL EISEN.

5. Blood Changes During Roentgen Therapy.
   H. W. GROTE, Bloomington, Ill.
   Discussion by I. S. TROSTLER.

Adjournment not later than 12:30.

Friday Afternoon Session, 2:00 P. M.

Dental Symposium

1. Relation of Roentgenology to Preventative Dentistry.
   HAROLD O. HANSEN, D. D. S., Chicago, Ill.

2. Neglected Requisites of Modern Dental Radiography and Interpretation.
   CLARENCE O. SIMPSON, M. D., D. D. S., St. Louis, Mo.

3. Roentgen Rays in Dental Diagnosis.
   W. A. GIFFIN, M. D., D. D. S., Detroit, Mich.

Executive Session

The dinner Thursday evening was enjoyed by more than one hundred members and guests.

Dr. William Allen Pusey, president of the Chicago Medical Society, delivered an address of welcome to the members and guests of the W. R. S., in behalf of the Chicago Medical Society.

Major Darnell and Dr. Brophy, who had seen service for quite some time, gave very interesting descriptions of their experiences overseas.

Dr. Rogers of Chicago and a number of others at the speakers' table presented very interesting after-dinner speeches.

MIDSUMMER MEETING AT COLORADO SPRINGS

The third Midsummer Meeting of the Western Roentgen Society.

Held at the Antlers Hotel, Colorado Springs, Colorado.

June 27th and 28th, 1918.

Meeting called to order by President B. H. Orndoff.

The program was very interesting and instructive, at the Colorado meeting.

One of the interesting features was Military Roentgenology.

Through the kindness of Major E. A. Merritt and Col. Christie a bedside unit was presented for the Society's inspection.

Dr. J. F. Wallace of the Springs gave a very interesting talk on tuberculosis work in the army.

Dr. J. F. Wallace, on behalf of the M. W. of A. Sanatorium, through its Medical Director and Superintendent, Dr. J. A. Rutledge, and the entire medical staff, extended an invitation to the members and guests of the Society to take lunch at the Sanatorium.

Following the luncheon the Society was shown through the Sanatorium by the medical staff, who were pleased to demonstrate the method of treatment and end results obtained in tuberculosis.

WHAT SHALL WE DO WITH THE KAISER?

As long as the flowers their perfume give,
So long I'd let the Kaiser live,
Live and live for a million years,
With nothing to drink but Belgian tears,
With nothing to quench his awful thirst,
But the salted brine of a Scotchman's curse.

I would let him live on a dinner each day,
Served from silver on a golden tray—
Served with things both dainty and sweet—
Served with everything but things to eat.

And I'd make him a bed of silken sheen
With costly linens to lie between,
With covers of down, and fillets of lace,
And downy pillows piled in place,
Yet when to his comfort he would yield,
It would stink with rot of the battlefield,
And blood and brains and bones of men
Should cover him, smother him—and then,
His pillows should cling with the rotten clay,
Clay from the grave of a soldier boy,
And while God's stars their vigils keep,
And while the waves the white sands sweep
He should never, never, never sleep.

And through all the days and through all the years,
There should be an anthem in his ears,
Ringing and ringing, and never done,

From the edge of light to the set of sun,
Moaning and moaning and moaning wild,
A ravaged French girl's bastard child.

And I would build him a castle by the sea,
As lovely a castle as ever could be,
Then I'd show him a ship from over the sea,
As fine a ship as ever could be,
Laden with water cold and sweet,
Laden with everything good to eat,
Yet scarce does she touch the silvered sand
Then a hot and Hellish molten shell,
Should change his Heaven into a Hell,
And though he'd watch on the wave swept shore,
Our "Lusitania" would rise no more.

In "No Man's Land" where the Irish fell,
I'd start the Kaiser a private Hell,
I'd jab him, stab him, give him gas,
In every wound I'd pour ground glass,
I'd march him out where the brave boys died,
Out past the lads they crucified.

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Bortz, Captain J. A. M. C., Receiving Group, Infirmary Four, Camp Joseph E. Johnston, Jacksonville, Florida.

Briggs, Captain G. C. U. S. A. Navy.

Burcham, Major T. A. Somewhere in France.

Chamberlin, Lieutenant A. R. U. S. A.

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Franing, Captain E. C. Galesburg, Ill.

Gilmore, Captain W. H. Fort Oglethorpe.

Hecker, Captain William.

Lier, Captain C. N. O. Somewhere in France.

Lowry, Lieutenant N. H. Boston—to receive instruction in Orthopedic Surgery.

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Moes, Lieutenant M. J. U. S. A.

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Wahl, E. W.

Wallace, Captain Joseph F. General Hospital 21, Denver, Colorado.

The above list of members of the Western Roentgen Society in various branches of the Army and Navy include all that we have been able to locate to date. A few of the addresses given are doubtless incorrect, and we would appreciate any additions, corrections, or changes of addresses with which you may be able to supply us.